The Magazine of BOTANY & GARDENING, British & Foreign.

Comprehending

Figures carefully coloured from Nature

of

FLOWERS, FRUITS & CRYPTOGAMIA,

WITH DESCRIPTIONS THEREOF

Together with original & select Papers & Reviews,

on the

Principles and Practice

OF

CULTIVATION.

EDITED BY JAMES RENNIE, M.A.

And Other Eminent Botanists.

VOL. 2.

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AND SOLD BY ALL BOOKSELLERS.

1834.

PREFACE.

We are now enabled to speak of this Magazine with a confidence which, much nearer the commencement of its career, would have been presumptuous. A definite purpose is generally contemplated by every new periodical undertaking of a literary kind, which has nevertheless to be afterwards shaped and modified by events that were not anticipated, and by circumstances of an uncertain order. Like an idea of a bright or noble character, that ripens, and swells, and gains in excellence, as we proceed to develope its proportions in a written form, even a well-considered monthly magazine will after a time become, in some particulars, a more symmetrical object, if uniformly conducted with zeal, than was ever dreamt of by its projector, however deep or direct-sighted he may have been. New fields open up, the tide of knowledge sets differently in, the taste of friends take a slight turn, so that altogether the offspring-shoot, though none of the original features be lost, assumes gradually an individual and peculiar direction and bearing, as much indebted to the style of its nurture as to its parentage.

But, to put similitudes aside—we unhesitatingly assert, that whatever were our original views and desires in reference to the "Magazine of Botany and Gardening," none of them have been varied but as respects their progress to perfection, whilst some additional topics of a kindred nature have been introduced, tending greatly to enrich the work. Allusion is particularly made to many original talented papers, several of them agricultural, but all connected with rural economy, in a manner that cannot but be appreciated by practical people, and all such as are eager after useful knowledge—the great object of desire in these matter-of-fact-days. It will also be apparent to our readers, that there has been, especially towards the beginning of the volume, no lack of scientific information regarding every point connected with the philosophical character or history of the vegetable world. We may say, indeed, that the physiology of plants, their chemical properties and anatomical structures, have been treated and illustrated in every manner, and by numerous hands. Our translations, our reviews, our original papers, have been largely devoted to these branches of inquiry. The gardening operations, strictly of a domestic character, and gardening experiments, have been most variously and abundantly introduced; whilst the botanical descriptions of plants, both according to the artificial and natural systems, are numerous and interesting. Of the plates, and the coloured figures of plants represented by them, we know not what to say that can be half so proper as that which one glance, especially of our late numbers, will suggest. Sixteen different highly finished plates coloured from nature, and sixteen close-printed pages of valuable matter, for one shilling, presents certainly a novelty, even in this age of cheap publications, and, with confidence we utter it, not to be equalled in the whole history of embellished literature.

Besides, our Magazine still maintains its distinctive character, as compared with all others of the class. As we have stated on a former occasion, the periodicals that give coloured figures uniformly confine themselves to a peculiar class, some being restricted to new plants, some to florists' flowers, some to fruits, and the like; whereas every object in the vegetable creation is embraced in our pages. We may, without the fear of contradiction and alone declare, that from the number of our pages, from the dense and varied matter which fills them, and from the labour bestowed on every portion, that no work in existence, of double the price, contains either the amount of delight and instruction, or the number of embellishments and subjects that the "Magazine of Botany and Gardening" does.

To any one a total stranger to our Periodical, and who has only been acquainted with our predecessors or rivals, the above title may suggest a mere nomenclature or catalogue of plants, and a gardener's directory for the months as they come round. Let it be understood, nevertheless, that we embrace a far different field. We combine the names and knowledge of things together; and whilst we chiefly strive after direct utility, we flatter ourselves that it is through a simple and intense perception of the beauties and the blessings of nature, as showered around us in the parts of creation more immediately contemplated by our work. We wish, as regards this enthusiasm, we could impart the taste to all. By far the cheapest and most lovely, the healthiest and most accessible studies, are to be found in the book of nature. It has been well said, that most studies abstract a man from the sky, the earth, and the sea; from the world of wonders that is every where around and above us. But we would be children still, plucking flowers, luxuriating in the fields, cultivating the friendship of every little monitor that grows there. In so far as our enthusiasm goes, it matters little whether it be the stately tree "that summers and winters with us," or the tinier and more uncertain visitants of the field or garden. They are each and all our companions, most of them our subjects. It is an affecting truth, that every plant cultivated by man assimilates itself in some measure to him, laying aside its natural habits and forms, and bending to his tutorage. But we are running wide of the limits and purpose of our Preface; forgetting that the delights of fancy are not the only or chief object of our labours; for, as rational and practical men, we pay the highest regard to the substantial and permanent good of the community. We endeavour to teach the blessings of rural life, domestic economy, and innocent pursuits. Above all, we love to trace the hand of a wise and benevolent Creator in every exhibition of nature that falls to be considered by us.

These various points and ends we shall continue to place prominently in our eye. Indeed, our arrangements and means will, in future, enable us to surpass anything we have yet done, as regards the beauty and value of our periodical. To begin with the figures of the plants—the artists hitherto employed have necessarily been acquiring greater dexterity and delicacy in copying the matchless forms and tints of nature; and, with something not unlike the ease and softness with which the sweet, the blushing, or the gorgeous flower comes forth, can almost in an instant design, sketch, or colour, with extreme fidelity, the object required. It is on this account that, in the course of the present volume, we have been enabled to give precisely double the former number of coloured figures; nor could any one otherwise understand, than as we have stated, how sixteen highly finished pictures should be furnished for anything like the price that the entire work, letter-press and all, amounts to. Of the late and future descriptions and selections of the plants, we need not say much. Botanists and students of nature must at once perceive and understand the accuracy of the science thereio displayed. We have only here to add, that if half a lifetime's devotion to any one branch of knowledge be a guarantee of a man's superority in that branch, it has been unequivocally secured by us.

Of the more miscellaneous and by much the largest proportion of the literary part of the work, it becomes us to use a few words. The whole of the letter-press amounts to sixteen double-columned pages quarto, closely and handsomely printed: in truth, every one of our shilling numbers contains as much matter as many small volumes do. In the course of this year it will be seen that we, by means of a smaller type, greatly enlarged the quantity of letter-press—a step naturally suggested by our greater familiarity with the various subjects found to be in demand by the public. And we again intimate, that for the future, we shall still farther increase the page, so as to be better suited to contain the additional information which we command, for every month; and this too without any alteration in price. Our increasing sale affords these advances.

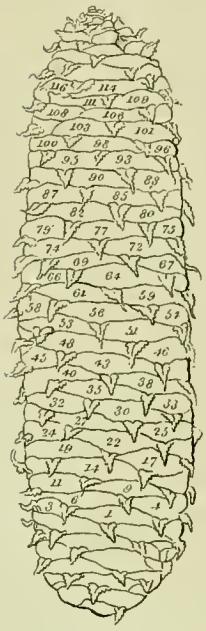
As to the precise subjects to be hereafter treated in our pages, it is impossible to speak very minutely. In what belongs properly to horticulture, it is not so much our study to search for rash novelties of persons of no note, as to collect the discoveries and experiments of skilful and scientific men. Utility is our great aim. Respectiag the culture of all sorts of plants, our pages may be looked to for the most striking lessons. The monthly operations as a calander shall be continued, and during the dreary and gloomy winter season, we purpose to enliven our readers with accounts of some curious and lightsome methods by which certain garden articles may simply and ingeniously be forced, to delight the eye or gratify the palate, not generally practised or understood. Some examples may be found in the last number of this volume, shewing how the summer may be, to a certain extent, transplanted into winter.

It will be observed that during the year, but more particularly towards the latter end of it, we have introduced a number of agricultural hints. Several papers have been devoted to that larger field of rural economy, which is, we think, a valuable feature in our work, inasmuch as it holds the place of an elder sister, and can never be entirely disjoined from practical gardening. We may especially allude, when on this point, to the articles under the names of individual counties, that treat of what is most prominent either in their excellence or their defects, as respects the agricultural art. These are to be regularly continued, pretty nearly in an alphabetical order; by which, at the close of the whole, the cream, so to speak, will be gathered into a small compass, of all that is known in regard to husbandry. It has already been in our power to shew, that not merely the rearing of crops will thus be described according to the most advanced practice, but that dairy husbandry, which nearly concerns the prosperity of every gardener and every cottager, will be made plain and interesting. To be sure, we have not as yet reached any county where the highest grain culture could be explained; but wait till Berwickshire appear; and then it will be seen what may be expected of the Lothians, Norfolk, Suffolk, &c.

The earlier numbers of this volume, as we have before mentioned, are full of scientific information regarding the vegetable kingdom; and throughout, the physiology of plants, being one of the most beautiful and instructive branches of study, has largely occupied our pages. Science will ever be a principal object in our labours, both as illustrated in original articles and in the works selected for review. And one inducement for the introduction of such matter is, that to inquiring minds it opens paths and shews lights by which new researches will be set on foot, leading to new discoveries. This is one mighty advantage connected with scientific studies, that they do not so much teach how the truth in question has been found out, or what may be its amount and value, as by what means and ways further research should be conducted. What can be more mischievous than to induce a feeling that nothing more is to be known, and that the wonders already found out are to be an impassable bar to the advancement of knowledge? The region is illimitable which man may explore, and the example furnished by what has been done, should be a stimulus to new, bolder, and more brilliant enterprise and conquest.

We have spoken of our reviews. In these our own remarks are studiously short: persuaded that an author, however defective his work as a whole may be, must present choice portions, the result of well-balanced consideration, which are more worthy of being introduced than anything we can be supposed to have in our power to state on the topic. We give briefly and fairly an opinion of the work; and then by the course taken, extract the riches of many an expensive, it may be ponderous tome, so as to present our readers with the wheat without the chaff, saving them, besides, a trouble that is not unfrequently of the most irksome kind.

We now close these prefatory remarks, which, in the fulness of our hope and purpose, seemed to us suitable to the second volume of this Magazine. It is only our desire at present further to add, that with increased energy, with enlarged resources, and with better prospects than ever, we enter upon a Third Volume, and a New Year.



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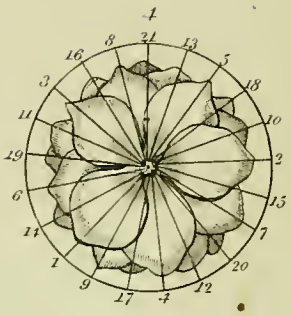

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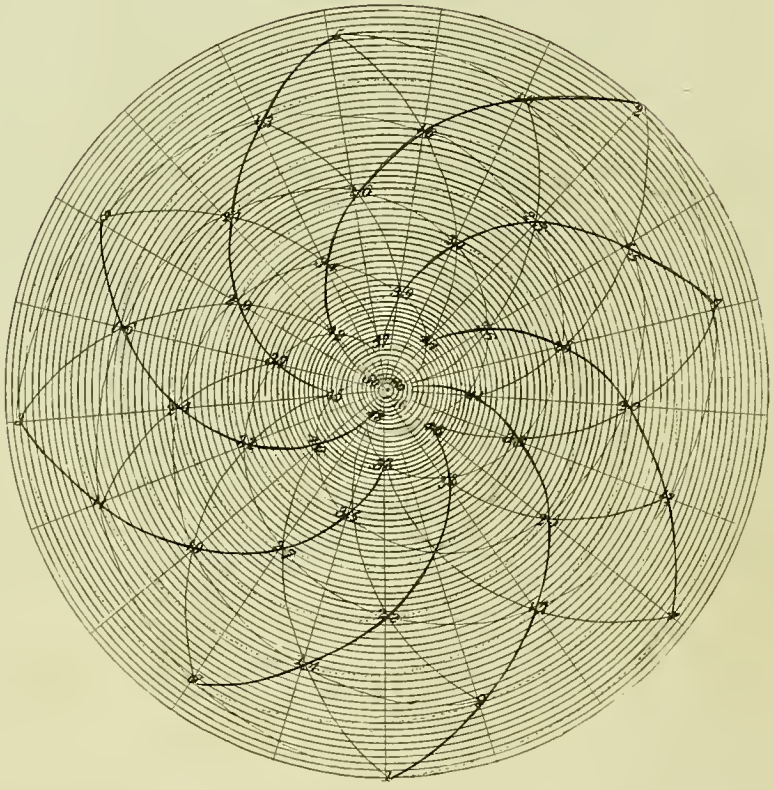

3

Disposition of the Scales in the Cones of Firs & Pines.

London, G. Henderson, 2, Old Bailey.

Chorizema nanum 1

Gentiana Cancasea 2

Babiana Stricta 3

Lachenalia nbida 4

THE

MAGAZINE OF BOTANY AND GARDENING,

BRITISH AND FOREIGN.

DESCRIPTION OF THE PLATES.

1. Chorizema nanum.
2. Gentiana Caucasea.
3. Babiana stricta.
4. Lachenalia rubida.
5. Melanthium viride.
6. Hedysarum roseum.
7. Cyclamen hederæfolium.
8. Thea Chinensis.

CHORIZEMA NANUM.

Decandria Monogynia, LINNÆUS; Leguminosæ, JUSSIEU.

Calyx tubulosus, 2-labiatus; labium superius emarginatum: labium inferius, 3-fidum laciniis acutis. Cor. papilionacea carina brevissima. Stylus recurvus. Legumen oblongum polyspermum.

Chorizema nanum; caule erecto flexuoso, foliis ovalibus obtusis spinoso-dentatis.

Pultenæa nana. *Bot. Repos. t.* 434.

A MINUTE shrub, with an upright wavy stem, hardly exceeding five or six inches in height. Leaves alternate, rigid, holly-like, eliptic, blunt, with undulated spinous margins. Leaf scales minute; spines at the angles of the stem and the foot-stalk. Flowers papilionaceous, distant, in longish flexuose clusters, growing upon the axils of the leaves. Pedicels very short, mostly recurved. Calyx tubular, two-lipped; upper lip broad, notched; lower lip shorter than the upper, three-toothed: teeth equal, acute. Standard large, notched, reflexed, yellow, with a red streaked star at the base; wings as long as the standard, very narrow, pendulous, crimson coloured. Keel not half the length of the wings, white, with purple tips. Stamens ten, distinct; anthers globular, white. Seed organ ovate-acuminate, villous; style short, recurved; summit abrupt.

M. Labillardiere, who went on the voyage to the south-sea in search of the unfortunate La Perouse, has given the first account of this genus in his relation of that voyage. To the species which he found on the south-west of New Holland, he gave the appellation of Chorizema ilicifolium, deriving its specific name from the resemblance of its leaves to those of holly, and that of the genus, probably, from the inconvenience its spinous leaves must occasion to the naked-footed dancers of that country.

Our plant is evidently not the same species as the one that is there described and figured, which is larger, and has narrower and more pointed leaves, but less, like those of holly. Specimens of both are preserved in the Banksian Herbarium; that of C. ilicifolium collected on the south-west coast of New Holland by Mr. Archibald Menzies, and that of C. nanum raised in the Kew garden (where it flowered in 1804), from seeds sent from the same by the late Mr. Peter Good.

Propagated by seeds, which it produces with us. It requires a soil similar to that used for the cultivation of heaths, and merely to be protected from the frost.

GENTIANA CAUCASEA.

Pentandria Digynia, LINNÆUS; Gentianeæ, JUSSIEU.

Corolla 1-petala. Caps. 2-valvis, 1-locularis; Receptaculis 2, longitudinalibus.

Gentiana caucasea; corollis quinquefidis hypocrateriformibus, fauce barbatis, foliis ovatis acutis caule tetragono ascendente; pedunculis axillaribus calyce longioribus.

ROOT biennial, stem square, ascending. Leaves opposite, sessile, ovate-acuminate, three-nerved, smooth, quite entire. Flower stalks axillary, one-flowered, as long as the leaf, solitary; at the extremity of the main stem there are frequently four flowers growing together crosswise, so that the flower stalks issue singly from the axil of each leaf. Calyx tubular, five-cornered, splitting with age, five-toothed: teeth awl-shaped, the length of the tube of the corolla. Corolla tubular, saucer-shaped, tube longer than the limb, greenish: limb violet coloured, four-cleft, segments blunt, throat bearded. Stamens five, enclosed; filaments inserted

at the base of the tube; anthers white; seed organ linear; summits two, divaricate. Capsule nine-pin-shaped, clothed with the persistent calyx and corolla, one-celled.

Mr. Loddiges raised it from seeds he received from Mount Caucasus. It flowers in July, and is propagated by seeds only. This is a hardy plant.

BABIANA STRICTA, VAR. γ.

Triandria Monogynia, Linnæus; Irideæ, Jussieu.

Babiana stricta.
Babiana purpurea. *Curtis* 119. *pag. alt.*
Ixia purpurea. *Jacq. Ic. Rar.* 2. *t.* 286. *Coll.* 3, 268. *Willd. Sp. Pl.* 1. 198.
Gladiolus strictus. *Vahl. Enum.* 2. 118.
Gladiolus purpureus. *Id. l. c.* 2. 114.
Ixia villosa. β. *Mart. Mill. Dict.*

This was enumerated by Jacquin and Curtis as a distinct species; but, upon comparing the living plants, no mark of specific difference appears, nor indeed any difference whatever, except colour and scent. It was imported by Messrs. Lee and Kennedy from the Cape of Good Hope. The specific character of Babiana stricta is,—flowers funnel-shaped and regular; the segments flat, and scarcely longer than the tube. It is propagated by off-sets in sandy heat.

LACHENALIA RUBIDA, VAR. α.

Hexandria Monogynia, Linnæus; Asphodeleæ, Jussieu.

Lachenalia rubida (floribus majoribus) foliis, lanceolatis pervaria macularum aspersione; corolla pedicellis pluries longiore, pendulo-natante, trigono-cylindrica, subbilabicata, staminibus huic subæqualibus imis tribus deflexo-convergentibus; stylo deflexo exserto; laciniis intimis subquarta parte longioribus, quarum infima e suis subbreviore subdifformi; extimarum suma suarum longiore, truncato retusa.
Lachenalia rubida. *Jacq. Ic. Rar.* 2. *t.* 398. *Coll.* 5. 60. *Willd. Sp. Pl.* r. 179.
(β.) Lachenalia tigrina. *Jacq. l. c. t.* 399. *Coll.* 5. 67. *Willd. l. c.* 180.
(γ.) Lachenalia punctata. *Jacq. l. c. t.* 397. *Col.* 2 323. *Willd. l. c.*
Orchis hyacinthoides foliis caude et floribus maculatis. *Burb. bent. Plant.* 3. *p.* 12. *t.* 20. *Olim perperam a Linnæo in Muntissa Alteridi (Veltheimiæ)* capensi *pro synonymo adscripta.*

Bulb truncated, oblong-ovate, about the size of a pigeon's egg, base umbilicated hollowed; leaves two to four, lanceolate, varying much in the spotting, having however the stains always round, sometimes very strongly marked and thick set, at others thinly sprinkled and faded, sometimes appearing on one surface only, at others on both; stem at first higher than the leaves, more or less coloured by close and confluent blood-red dots; cluster lax, few—many flowered; flower scales small ovate, acuminate, decurrent, membraneous; corolla an inch or more in length, trigonal-cylindric, subbilabiately patent pendulous, several times longer than the pedicles, receiving a carmine hue from numerous thick-set dots of that colour, which are spread over a transparently whitish ground; segments distinct quite to their base, outer a fourth shorter, appressedly incumbent on the inner, cuneate oblong, concave, thicker; subcalycinate, upper one the longest of the three truncately retuse and glandulary thickened at the top; inner ones obcuneate-oblong, patulous upwards, convolutely concave downwards, lower one rather shorter and somewhat differently shaped; stamens fixed to the bottom of the corolla, to which they are about equal, compressed filiform, the three upper a little the longest, diverging, lower ones deflex, converging, resting on the lowest segment; anthers reddish, oblong-sagittate; style slender, deflex protruded considerably beyond the stamens, attenuated; summit indistinct when magnified, appearing blunted triquetral, and glandularly pubescent; germen pale, ovate, trisulcate, three-lobed, trigonal, lobes pulvinate.

A native of the Cape of Good Hope; should be kept in the green-house with other bulbs from the same country, and planted in a small pot, with a mixture of three-fourths peat earth to one of loam; blooms in the autumn.

MELANTHIUM VIRIDE.

Hexandria Trigynia, Linnæus; Melanthaciæ, Jussieu.

Bracteæ nullæ. Corolla infera, æqualis, ex hexapetalo-partita varie patente ad hypocrateriformem, unguibus in angulorum coalitis, laminis stellatim aut rotatim solutis. Stam. aut immediate hypogyna, aut adnata unguibus, aut per tubulum decurrentia. Style 3, stigmatosi, rostratim continui, persistenses, raru filiformes, decidui. Caps. coriacea, varie pulvinatim trigona. Sem. plurima, subglobosa vel-eompresso orbiculata.
Radix bulbus solidus, ovato-pyramidatus, hinc basi oblique depressus, membrana sæpius crustacea vel subputaminea tectus; a se ipso quotannis renascens frugifer, dum ille precedentis anni (functa modo vice matricis, cæteroquin sterilescens) totus emarcescit. Folia tria-plurima disticha canaliculata-lanceolata, vel angustiora convoluta-concava, rarius subfistulosa, deorsum vaginantia, conduplicantia. Scapus de subnulto bipedalem usque. Inflor. I-multiflora, vel spicata, vel racemosa-paniculata pedunculis magis minusve decurrenter adnatis, modo subcorymbosa. Stigmata parum manifesta ad tentem rimulæ oblique dehiscentes. Filam. setaceo-subulata Quando laciniæ ad infra usque germen sint distincta perstat corolla, dum vero cohærescunt istæ, ut quomodocunque dictum cingant organum, per ejusdem incrementum tandem dejecitur. Genus Tulipæ adeo propinquum ut vix detur unde distinguere.
Melanthium viride foliis caniculato-lanceolatis; caule folioso paniculato-racemoso, pedunculis unifloris deorsum decurrenter-adnatis; corolla persistente, cernua, laciniis reflexis juxtum supra genu areola colorata cum disco scrobiculatim depresso notatis; stylis deciduis, filiformibus, stamina exsuperantibus, divaricatis.
Melanthium viride. *Linn. Suppl.* 213. *Hort. Kerv.* 1. 488. *Thunb. Prod.* 67. *Bot Rep. t.* 233. *Willd. Sp. Pl.* 2. 269.
Ornithoglossum glaucum. *Parad. Lond. t.* 54.

Bulb solid, about an inch and a half high, ovate-pyramidal, flatted obliquely on one side of the base, covered with a somewhat crustaceous membrane like that of a tulip root; leaves opposite, alternate, radical one close, largest, channelled-lanceolate, far-acuminate, recurved; stem leafy, angular, somewhat taller than root leaves, branched downwards, upwards paniculately racemose; peduncles divergent, numerous, one-flowered from the axils of the leaves (which become gradually smaller), more or less decurrently adnate to the stem, recurved, thickening

at their top; corolla cernuous, hexapetously divided persistent; segments green, edged with purple-brown, equal, subulate-lanceolate, reflex, convolutely concave, shortly unguiculate, marked just above the bend with a roundish spot, the disk of which is slightly hollowed; filaments exactly hypogynous, subulate-setiform, one-third shorter than segments, divergent, recurved; anthers small, sagittately ovate, brown; germen obconic-globular, rounded-trigonal; styles three, green, filiform, extending by half their length beyond the stamens, urceolately divergent, not beakedly continuous with the germen, deciduous; stigmas inconspicuous, obliquely slit, hiant, brown. The whole plant scentless. It should be kept in the green-house, and treated like other Cape bulbs.

HEDYSARUM ROSEUM.

Diadelphia Decandria, LINNÆUS; Leguminosæ, JUSSIEU.

Calyx 5-fidus; Corolla carinâ transverse obtusâ. Seg. articulis 1-spermis compressis.

Hedysarum roseum; caulescens, assurgens, foliis pinnatis septemjugis; foliolis ellipticis, racemis capitatis axillaribus pedunculatis, vexillo striato emarginato carina longiore.

THIS plant was drawn from a specimen raised by Mr. Loddiges, from Mount Caucasus. It is probably biennial, as some of the plants, but not all, flowered the same year they were drawn.

CYCLAMEN HEDERÆFOLIUM.

Petandria Monogynia, LINNÆUS; Primulaceæ, JUSSIEU.

Corolla rotata, reflexa, tubo brevissimo; fauce prominente. Bacca tecta capsula.

Cyclamen hederæfolium; foliis cordatis angulatio denticulatis. *Hort. Kew.* 1. *p.* 196. *Willd. Sp. Pl.* 810.
Cyclamen Europæum. *Mill. Dict.* 1.
Cyclamen folio hederæ et vernum. *Lob. Icon.* 605.
Cyclamen romanum foliis hederæ, flore carneo et flore purpureo. *Swert. Florileg. t.* 49.
Cyclaminus orbicularis. *Dod. Pempt* 337.
Cyclaminus vernotempore floreus. *Clus. Pan.* 234. *Hist.* 265.
Cyclamen hederæfolium. *Bauh. Pin.* 308. *Ger. emac.* 844. *r. f.* 5. *Raii Hist.* 1206.
Cyclamen vernum flore purpureo. *Park. Parad.* 195. *t.* 197. *f.* 1.

THE ivy-leaved Cyclamen is said to be a native of Italy; is a very valuable plant, on account of its early flowering, sweet scent, and beautiful foliage. It is not so hardy as C. Europæum, but can be cultivated in the open ground. May be propagated by cuttings of the root. It was cultivated by Gerard in 1596.

THEA CHINENSIS, VAR. β.

Monodelphia Polyandria, LINNÆUS; Camellieæ, JUSSIEU.

Calyx 5—6 partitus; corolla 5—g. petula. Styli 3 coaliti. Caps. 3-locularis. Sem. solitaria.

Thea Chinensis; floribus subhexapetalis axillaribus subsolitariis erectis, fructibus nutantibus.
α. Thea viridis. *Sp. Pl.* 735 *Willd.* 2. 1180. *Reich.* 2. 589. *Hill. Exot. t.* 22 *Gœrt. Fruct.* 2. *p* 83. *t.* 95. *Letts. Monog. t.* 1. *Woodv. Med. Bott. Suppl.* 116. *t.* 256.
Thea bohea b. stricta. *Hort. Kew. vol.* 2. *p.* 230?
Thea sinensis. *Blackw. t.* 351.
β. Thea bohea; *Linn. Sp. Pl.* 734. *Hort. Cliff.* 204. *Amœn. Acad.* 7. *p.* 239 *t.* 4. *Hill. Exot. t.* 22. *Blackw. t.* 352. *Thunb. Jap.* 225. *Willd.* 2. 1180. *Hort. Kew. v.* 2 *p.* 230. *var. a laxa. Mart. Mill. Dict. Lettsom. Mon. ed.* 2. *p.* 41. *Ic.*
Thea cantoniensis. *Tour. Cochin.* 339.
Thee. *Kœmpf. Amœn.* 605. *t* 606.
Thee frutex. *Barth. Act.* 4. *p.* 1. *t.* 1. *Bont. Jav.* 87. *t.* 88. *Barrel. Rar.* 123. *t.* 904.
Thee Sinensium. *Breyn. Cent.* 111 *f. m. pag.* 111. *Ic.* 17. 2. 3. *Boc. Mus.* 114. *t.* 94. *Raii Hist.* 619.
Chaa bauh. *Pin.* 147. *Bauh. Hist.* 3. *l.* 27. *c.* 1. *p.* 5.
Euonymo affinis arbor orientalis nucifera, flore roseo, *Pluk. Phyt. t.* 88.
Camellia bohea. *Ker.*

IT is now nearly ascertained that all the different sorts of tea, prepared in China, are the produce of the same species; and that the colour, form, and qualities, depend chiefly upon the climate, soil, age, modes of preparation, and various manipulations that the leaves are subjected to. The bohea variety appears, however, to be more tender than the green, and will not endure the severity of our winters, which the latter bears with impunity.

According to Mr. Ker, Thea and Camellia cannot be kept apart, but must be united into one genus. The imbricated calyx of the latter may be thought to keep them distinct, though the former has likewise a few scales at the base, which soon fall off. Most certainly, however, even in the Linnæan system, Camellia and Thea ought not to have been placed in different classes, for the filaments and petals of the tea all coalesce at the base, and always fall off united in one piece, though, if examined when the flower first expands, the filaments will be seen firmly attached to the receptacle.

The variety here figured, according to Loureira, grows in the province of Fo-kien, in China; and occurs also, both indigenous and cultivated, in the province of Canton.

It flowers with us in the autumn, and when planted in the open ground not at all, except in the most favourable seasons. It may be propagated by cuttings.

ON THE DISPOSITION OF THE SCALES IN THE CONES OF FIRS.*

BY A. BRAUN.

See Plate 22.

IN 1829, Dr. C. Schimper explained to the Society of German Naturalists, assembled at Heidelberg, the notions he then had of the laws which regulate the relative position of leaves. This gave M. Braun the idea of studying in detail the cones of the pines and firs, by which he expected to throw some light

* Nova Acta Phys Med. Acad. Caes. Leopold. Nat. Curios. Bonn. Tom. xv. p. 197.

on the disposition of the foliaceous organs in general. We will follow the author in the development of this idea.

The scales of fruits in the Coniferæ are, in fact, only leaves accompanying the pistil, that do not, like the floral envelopes of other plants, form a complete cavity surrounding on all sides the sexual organs, but which offers a slightly concave surface that protects them only on one side. This being granted, if we consider attentively the cone of a pine (Pinus picea), or a fir (P. abies), we first observe whether the scales are disposed in spirals or whirls. On breaking a cone of the P. picea (pl. 22, fig. 4,) in the middle, three scales will be seen, which at first appear on the same plan, but on a more attentive examination it will be perceived, that the depth of their insertion are really different, and also that they are placed at unequal distances; so that they must not be considered as forming a whirl, but rather as making a part of a very close spiral. On examining the external surface of the entire cone, it will be found that the shells are disposed in oblique lines, which may be considered, first, with regard to their composition, or the number of shells necessary to form a complete spire; second, their inclination, or the angle more or less open or obtuse which they form with their axis; third, of their total number, and their arrangement round the common axis, which constitutes their coordination. Lastly, we should endeavour to discover whether the spires turn from the right to the left, or from the left to the right.

The inclination of the spires on their axis is of little importance; it varies according to the length and the age of the fruit. The question as to whether the spires turn from left to right or from right to left is equally unimportant. Nevertheless, in order to avoid confusion, it must be remarked, that the spectator ought to consider himself as forming the axis of the spire, so that his left hand is changed to the right, and *vice versa*, exactly as if he beheld himself in a glass.

If we consider attentively the spiral lines formed by the scales of the P. abies (pl. 22, fig. 1), we shall at first see that the most prominent turn from left to right, and that they are of the number of five parallels between them. The first of these spirals is denoted by ciphers 1, 6, 11, 16,....46, 51, 56, 61, 66,....96, 101, 106, 111, 116, &c.; the second 4, 9, 14, 19, 24, 54, 59, 64, 69, 74, 79,....109, 114, &c.

After some researches, we shall find a second kind of spirals turning the contrary way, and denoted by the ciphers 1, 9, 17, 25, 33, &c.; this spiral has eight parallels. All the kinds of spires, however, are not yet exhausted; they become less evident, because the scales which constitute them are more distant, but they may still be traced by an effort of attention, and it will be remarked that they become more and more vertical. Thus it will quickly be discovered that parallel spires still exist (fig. 1), one of which answers to the numbers 1, 14, 27, 40, &c., which are to the number 13; and, finally, we shall arrive at a last series of scales which is only a straight line entirely vertical. One of these vertical lines is denoted by the ciphers 1, 22, 43, 64, 85, 106. These lines are of the number 21, and they are named ranks (*Zeilen*) in opposition to the true spires (*Wendeln*).

We here make a remark entirely incidental, which will be found applicable hereafter. If we place in succession the numbers

21, 13, 8, 5,

which expresses the number of parallel spirals of each kind, we shall see that each of these numbers is the difference of the two that precede it, or the sum of the two that follow it. Thus $8=21,—13$, and $13=8+5$. Not being able to continue the series beyond 21, which expresses the parallel vertical ranks, evidently the most numerous, let us continue it in another sense, by subtracting each number from that which precedes it:

21, 13, 8, 5, 3, 2, 1, 1, 0.

Neither of the spires which we have hitherto found is the true one, the generative spire, since each (abstracting its parallels) comprehends only the 5th, the 8th, or the 13th part of the total number of the scales; but with patience we shall at length find spires which have only three parallels (fig. 1.) 1, 4...., 16, 19, 22, 25, &c., others which have only 2: 1, 3...., 9, 11,....17, 19...., &c. The figure 2 represents all those spires denoted by different colours. The ranks (*Zeilen*) to 21 parallels are marked by the black lines, those to 13 by black dots, those to 8 in blue, those to 5 in red, those to 3 in yellow.

By the method of exclusion, we shall at length arrive at a single spire without parallel. We confirm this result by marking all the scales which we rank according to this spire, with a particular sign, and recollecting that to the last *all* the scales of the cone are marked with the sign which we have adopted. The spire found is then the fundamental or generative spire; all the others previously examined are only false appearances, fictitious series, a secondary result of the primitive disposition of the scales; this is demonstrated by the figures 3 and 4, where the ciphers indicate the order of succession of the bracteas.

Let us now count the number of scales which form this fundamental spire, or, in other terms, let us ascertain after how many scales we meet with one placed vertically over the first; so that we may consider the round of the spire as commencing again. We shall find that it is the 22d leaf (fig. 3.) which corresponds with the first, and that the spire is consequently composed of 21 scales. We shall, more-

over, observe, that it is after eight turns that the 22d leaf is found placed above the first; consequently, when we would give an idea of a position of leaves, it is not sufficient to say that the 22d is found beneath the first; we must add after how many turns this coincidence occurs. If we now place (fig. 4.) the ciphers 1, 2, 3, 4...., 21 at the extremity of the rays which traverse the summit and the base of the scales to indicate their order of succession, each of these ciphers will not be placed on a ray contiguous to the ray of the following cipher, but, on the contrary, it will be separated by 7 intermediate rays from the cipher that immediately succeeds it. We explain this by saying that the divergence is marked by the number 8; and the spire will be noted by means of the fraction $\frac{8}{21}$, the numerator indicating the number of turns on the divergence, the denominator that of the scales. In representing on a plan (fig. 3.) the projection of a cone, in such a manner that its axis reduced to 0 may be the centre, we may indicate, with different colours, the different spires according to which the bracteas are disposed, and we shall clearly see that the generative spire expressed by the fraction $\frac{5}{21}$ is the only one that comprehends all the scales of the cone. We may also conceive that amongst these diverse spires will exist arithmetical relations, which will express the various combinations of a certain number of elements disposed in a regular manner. Thus we shall find that a spire which has 5 parallels will always pass by the 5th leaf, the leaves being numbered according to the fundamental spire, that is to say, it will pass by the ciphers 1, 6, 11, 16, 21, 26, 31, &c., or 5, 10, 15, 20, &c.; the series to three parallels will pass by the numbers 1, 4, 7, 10, &c. With the aid of this table, it is easy to enumerate the bracteas of a cone. Beginning from a scale taken at random, we mark a spire to 8 parallels; for example, the ciphers 1, 9, 17, 25, &c., of which the difference is always 8. Commencing from the same bractea, we describe one of the spires to 13 parallels by 1, 14, 27, 40, &c.; that to 5 parallels by the ciphers 1, 6, 11, 16, &c. We may then with these three kinds of spires, by additions and subtractions, proceeding by 8, by 13, and by 5, mark all the scales of the cone; the spirals to 2 and 3 parallels are not sufficiently evident to be used without fear of error. When the whole cone is enumerated, the series of ciphers 1, 2, 3, 4, &c. permits us to follow that of the scales in the generative spire which before was not visible.

When we have denoted by $\frac{8}{21}$ the divergence of the leaves in the fundamental spire, we have not satisfied ourselves on the divergence of the spirals deducted from the generative spire. But if the divergence in the latter (fig. 4.) is $\frac{8}{21}$ between the first and the second scale, it will be $\frac{16}{21}$ between the first and the third, moving from right to left like the generative spire; but on turning the contrary way, its divergence will be only $\frac{5}{21}$. Or, the spiral that contains the bracteas 1, 3, 5, &c. is that of two parallels: its divergence then will be $\frac{5}{21}$. At the same time, we observe that this spire turns contrary to the generative spire, since in that direction we find the least divergence. The fourth leaf of the fundamental spire will again fall beyond the first; or, the spiral which goes successively from the first to the fourth, and to the seventh bractea, is the spire of three parallels; its smallest divergence will be $\frac{3}{21}$, and the spire will turn in the same direction with the fundamental. These arguments apply to all the other spirals, and we can establish the series

$$\frac{13}{21},\ \frac{8}{21},\ \frac{5}{21},\ \frac{3}{21},\ \frac{2}{21},\ \frac{1}{21},\ \frac{1}{21},\ \frac{0}{21}.$$

Since $\frac{5}{21}$ expresses the divergence of a spiral going in a contrary direction to $\frac{8}{21}$, it follows that $\frac{13}{21}$ will also be contrary to the generative, while $\frac{8}{21}$, $\frac{3}{21}$, $\frac{1}{21}$, will be in the same direction. We also see that in order to find the divergence of any line whatever, or, in other terms, the expression of that spiral itself, it is sufficient to subtract each numerator from that which precedes it.

In fact, $\frac{5}{21} = \frac{13}{21} - \frac{8}{21}$, and $\frac{3}{21} = \frac{8}{21} - \frac{5}{21}$.

M. Braun afterwards investigated the height which separates the first scale of a spire from the last; which is termed the distance. It will be easily conceived that the question respects only the relative distance or the number of scales interposed, for the absolute distance will vary not only with each cone, but also according to the age of each fruit taken singly. It is evident that the generative spire $\frac{8}{21}$, which takes in all the scales, is that which moves the most horizontally. We will therefore express the distance in height, which separates the two scales numbered 1 and 22, by the expression $\frac{1}{21}$, the spire of two parallels by $\frac{2}{21}$, in such a manner as we shall find for the vertical series which rise parallel to the length of the cone, or where the divergence is 0, $\frac{21}{21}$ which agrees with the experiment, since they are composed of 21 scales, and the last separated from the first by the same number.

If then we take the series of divergences, and place beneath them that of the distances, we shall have the two series contrary.

A. $\frac{21}{21},\ \frac{13}{21},\ \frac{8}{21},\ \frac{5}{21},\ \frac{3}{21},\ \frac{2}{21},\ \frac{1}{21},\ \frac{1}{21},\ \frac{0}{21}$.

B. $\frac{0}{21},\ \frac{1}{21},\ \frac{1}{21},\ \frac{2}{21},\ \frac{3}{21},\ \frac{5}{21},\ \frac{8}{21},\ \frac{13}{21},\ \frac{21}{21}$.

The numerator of each fraction of the series A, will show us the number of turns in each spire, and that of the corresponding fraction in B, the number of parallel spires of each order. Thus the spire $\frac{5}{21}$ accomplished its revolution in 5 turns, but it has but one parallel, or, in other words, there are but two spires of this order in the whole cone, as indicated by the fraction $\frac{2}{21}$ placed beneath. The common denominator marks the number of elements which compose each of these spires. Second inference:

the expression $\frac{1}{2}\frac{1}{T}$ denotes in the series of distances B the generative spire, and we see that, being twice found, it corresponds in that of the divergences to the two fractions $\frac{1}{2}\frac{1}{T}$ and $\frac{8}{2}\frac{8}{T}$, which is explained by putting $\frac{13\ V\ 8}{21}$, the sign V indicating that the two spires correspond to the same generative, but that one goes from right to left, and the other from left to right.

The whole question then of the spires is reduced to the knowledge of the divergence and of the number of scales forming the generative spire, since, these two being ascertained, we may easily conclude on the number of the turns and the distance in height of all the others.

The determination of the inclination of the spires is still inferred from the relation found between the divergences and the distances; it is equal to the divergence divided by the distance, and gives the following series of quotients:

$$0,\ \tfrac{1}{T\,3},\ \tfrac{1}{8},\ \tfrac{2}{5},\ 1,\ \tfrac{5}{2},\ 8,\ 13\tfrac{1}{0}.$$

And we obtain two series, one descending to 0, which is the case of the horizontality, the other ascending to infinity, which explains the vertical position.

It was not until after long trials that the author succeeded in finding the condition indispensable to the determination of a spire, that is, the divergence of the elements which constitute it. We must pursue a more expeditious method in order to discover it in a plant or a cone. In the Isatis tinctoria, it is not difficult; the generative spire, like the cones of the Firs, is expressed by $\frac{8}{2}\frac{8}{T}$, and it is at the same time the most apparent. But it is not always so, more frequently the fundamental spire is the least striking of all. If we had the divergences of two kinds of spires expressed by the fractions which follow each other in the series A, it would be easy, by subtracting them from each other, to obtain the complete series; but it often happens, as in the involucres of the Cinara and the Corymbeferæ, that the cone is not terminated, and the turns of the spires, which recur only at a great distance in height, remain incomplete, because the axis is too short. Nevertheless, we can always determine the number of the parallels of two or several spirals. Let us suppose that, in the case of one cone, we have found that it had spirals of 5 parallels, others of 8: we should have established by addition and subtraction the following series:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55.....

On one hand, the series has no limits until we have found the number of the vertical ranks (21 in the cone of the fir); but it is often difficult to recognize these lines. We must therefore seek by another process; this process will consist in counting the number of spirals, including the perpendicular series (*Zeilen*), which approach nearer to the vertical than those which we have noted. Having found the spires 5 and 8, there are still two which are less inclined, one $5+8=13$, the other $13+8=21$, the last number that explains the vertical ranks; the series ought therefore to stop at 21. We have seen that the numerator of the fraction of the distances marked the number of the spires of each order in a given cone; we have also seen that the series of distances is that of the divergences reversed (series A and B), and the common denominator, the number expressing that of the vertical ranges. These two series being established, the generative spire will be that where the fraction of the distances will have 1 for its numerator, since that spire is always singular. The corresponding fraction in the series A will give the divergence of this same spire.

Having established the means of determining the secondary and generative spires on a cone, we must now enquire whether the expression $\frac{8}{2}\frac{8}{T}$ found on some cones of pines is invariable if there are variations; and, lastly, if, amidst these variations, we can seize any fixed law.

There exist two varieties of spires. At first sight it often happens, that after the spires to 5 and 13 parallels, instead of finding the vertical rank (21) which terminate the series, we still find $13+21=34$, and $21+34=55$, which express the number of the parallel ranks, and if we establish the two series of the divergences and the distances, we shall have:

$$\begin{array}{c} 0,\ 1,\ 1,\ 2,\ 3,\ 5,\ 8,\ 13,\ 21,\ 34,\ 55. \\ \hline 55,\ 34,\ 21,\ 13,\ 8,\ 5,\ 3,\ 2,\ 1,\ 1,\ 0. \\ \hline 55 \end{array}$$

This gives $^{3}\frac{4\,V\,2}{5\,5}{}^{1}$ for the expression of the generative spire, and experience proves, that in these cones the twenty-second leaf is not found placed vertically over the first, but the fifty-fifth. A slight twist of the axis is sufficient to produce this result, but it is not purely accidental; the effect of growth for example, as it is found in very young cones. All this does not weaken the general law. In fact, these irregular cones are only regularly twisted, so to speak, on themselves and in which the last cipher of the series expressing that of the vertical ranks is greater; but such a cone contains not less, as a generative element, than that of the regular cone.

The regular generative spires of the cones of all the species of pines, analyzed by M. Braun, give the following series:

$$\frac{0}{1},\ \frac{1}{2},\ \frac{1}{3},\ \frac{2}{5},\ \frac{3}{8},\ \frac{5}{13},\ \frac{8}{21},\ \frac{13}{34},\ \frac{21}{55},\ \frac{34}{89},\ \frac{55}{144},$$

The following has regard to the species, with their fundamental regular spire.

$\frac{2}{5}\frac{1}{5}$ *Pinas pinaster.* $\frac{1}{3}\frac{3}{4}$ *P. sylvestris, P. pumilio, P. montana. P. resinosa, P. halepensis.* $\frac{8}{2}\frac{8}{1}$ *P. picea, P. cembra, P. larix, P. pendula.* $\frac{5}{1}\frac{5}{3}$ *P. strobus, P. canadensis.* $\frac{3}{8}$ on a single cone of *P. canadensis.* $\frac{2}{3}$ *P. microcarpa.* The divergences $\frac{1}{3}$, $\frac{1}{2}$ and also $\frac{0}{1}$, which denote a rank of bracteas placed one over the other, are not met with in the cones of the pines.

It would now be interesting to investigate if a

common tie re-unites these different series of bracteas, whether they can all be traced to a common origin. The number of turns, that of the scales of each spire, the angles of divergence give nothing with certainty.

It is not under one particular point of view, but the whole of the elements, considered collectively, that we find fixed and invariable relations. Thus, in the preceding series, each fraction is the sum of the fractions that precede it, which gives a certain proportion between the number of turns in a spire, and that of the scales which constitute it. Example: $\frac{1}{2}+\frac{1}{3}=\frac{2}{5}$; therefore each fraction is a proportionate arithmetical medium between the two fractions which precede it, and we establish the following equation:

$$\frac{5}{13}=\frac{3+2}{8+5}=\frac{2+2+1}{5+5+3}$$

That is to say, one spire is equivalent to the reunion of several others, whose sum is equal to the fraction which represents it. This the author proves by the figures.

M. Braun infers from the series which we have established, a number of other conclusions which are only results of calculations, translated in vulgar language. We have reported enough to give an idea of his manner of proceeding, which in his deductions are entirely mathematical, verifying nevertheless the justness of his calculations on nature. Does any relation whatever exist between the disposition of the bracteas of a cone and that of the leaves on the branches of the same species of pine? Experiment proves that there does. Thus, on the *P. abies* and *P. picea*, the buds containing the clusters of leaves are disposed like the scales of the cone according to the series $\frac{1}{2}\frac{3}{1}$, sometimes ${}_2\frac{8}{1}$, and, finally, sometimes, but very rarely, $\frac{2}{5}\frac{1}{5}$. *P. Canadensis* ${}_1\frac{5}{3}$, also the *P. sylvestris*, *P. Larix*, *P. Europæa* $\frac{1}{3}\frac{3}{4}$; expressions which are often identified with those which we have found for the cones of these different species.

The examination of a catkins in the *Amentaceæ*, and particularly in the section of the *Betulineæ*, gives results analogous to those which we have obtained from the coniferous. The *Betula alba* and *B. pubescens* give ${}_2\frac{6}{1}$ and $\frac{1}{3}\frac{3}{4}$. The *B. fruticosa* generally ${}_1\frac{6}{3}$. The *Alnus glutinosa* and *A. incana* ${}_2\frac{8}{1}$, rarely ${}_1\frac{5}{3}$. The small catkins of *Corylus* often exhibit anomalies. The regular spire of the *C. avellana* is ${}_2\frac{8}{1}$, that of the *C. Americana* and *C. tubulosa* $\frac{1}{3}\frac{3}{4}$. The male flowers of the *Quercus robur*, of the *Populus Nigra* and *P. tremula*, are placed according to the divergence $\frac{3}{8}$. The male catkin of the *Carpinus betulus* are disposed $\frac{1}{3}$. The leaves are ranked according to the more simple spires: $\frac{1}{2}$ in the genus *Fagus*, *Castanea*, *Carpinus*, *Corylus*; $\frac{3}{8}$ and $\frac{2}{5}$ in the leaves of the willows *(Salix cinerea, S. capræa, S. fragilis)*, and the poplars *(Populus Italica, P. tremula)*; $\frac{2}{5}$ in the oaks.

M. BIOT ON THE SAP OF PLANTS.

In all my experiments the motion of the sap appears to me to proceed from the eminently *hygroscopic* quality of the vegetable tissue. The sap received at the roots evaporates by the leaves, whilst between these points the vegetable tissue acts precisely as a cylinder composed of animal charcoal, covered with an impenetrable envelope, and with its lower part immersed in liquid. The column is thus supplied with all the liquid that it can contain; the vegetable tissue becomes itself in the state of saturation that suits its mass under the existing temperature. This kind of equilibrium being established, should any cause—a sudden change of temperature for instance—increase the evaporation at the extremity of the branches, these will act by suction, draw more from the roots, and the equilibrium is still preserved. Should, however, the roots come to furnish more, and the leaves evaporate less, then will ensue turgescence in the vegetable tissue; and if a hole be made, the sap or liquid will overflow. This is precisely what is observed in the birch tree in spring, when its sap begins to rise, and before its leaves have come forth or are able to perform their task of evaporation.

As another trait of resemblance, it may be remarked, that the lateral action of heat on an hygroscopic column, such as we have represented the vegetable tissue to be, would have the effect of rendering it capable of less saturation, and consequently, would oblige it to throw out a part of the liquid it contains. This is the effect which the sun produces upon the birch, and upon other trees, whose sap runs out at this period. When the leaves come, these phenomena cease; the task of evaporation is performed, and the sap bursts neither from the bark, nor through an orifice, if made.

Now, suppose we replace the impermeable or air-tight envelope by one, on the contrary, capable of absorption from within, and exhalation without, the state of things will be changed. The issue of the sap or liquid by the sides of the envelope, will be more frequent and facile. The diminution of the exhaling power by a sudden cold will favour it, and the sap will burst forth at once from all the pores of the tree equally, taking into account merely the different degrees of thickness in the bark. Such is an account of the emission of sap by the sides of the nut-tree and sycamore in spring.

The influence of the leaves on the internal motions of the sap in trees being thus explained, let us observe what will be the consequence if these leaves, or great evaporating organs, be enveloped with a colder

atmosphere. The sap conveyed to them being no longer evaporated, will rest and collect on their surface, and check all evaporation, especially at night. The upper parts of the vegetable tissue, or hygroscopic column, being thus overcharged, will let fall their superabundance upon the parts that are lower, which will produce a descent of the sap. Hence proceed the alternative ascent and descent of sap, such as have been noticed. Moreover, these effects will become continuous, if the evaporating property of the leaves should diminish before the supplying power of the roots ceases to throw up the sap; and this is precisely the case in September: the same trees that afforded me, but their ascending sap in the spring, in September afforded a continual sweat. The latter was no longer the same as the spring sap, for it contained no saccharine principle.

M. Biot concludes, from his experiments, that the alimentation of the foliaceous organs is accomplished principally during the day; whilst the alimentation of roots, and the formation of new layers of them, is effected during the night, when the diminution of evaporating power in the leaves precipitates the sap in a descending course towards the roots.

That in deciduous trees, the annual increase of the trunk and branches taking place in summer, the increase of the roots takes place in winter. The ascending motion is thus suspended by the cold, and the absence of leaves allows the sap to accumulate in the roots, which experience little of the atmospheric variations, and which, in the first warmth of spring, send up their accumulated juices with force, through the uppermost parts of the tree.

ON IVY.

BY CHARLES A. BREW, ESQ.*

Though I am of opinion that the useful and entertaining publication edited by you is neither perhaps so well calculated, or at all intended for the admission of communications from occasional correspondents altogether unacquainted with the subjects of which it treats in a scientific view, yet as it strikes me that you may introduce into some of your own judicious observations or lucubrations a hint, either generally or particularly beneficial to society, I take the liberty of putting you in possession of the following observations and suggestions, which I some time since made, and of which I was again reminded by reading in your fourth number Dr. Johnston's remarks on Ivy.

It appears, at least in this country, to be a very generally received opinion, or rather let me call it prejudice, and one neither, as I think, supported by experience nor judicious and right reasoning, observation of the laws of nature, and analogous results under similar circumstances, that permitting ivy externally to cover the walls of houses, occasions an internal damp, and is therefore injudicious and injurious; whereas I am persuaded, both by experience and observation, that the very contrary is the fact, and that if it could be as promptly applied and made available, it would be a far more effectual preventive against damp walls than weather-slating, or any other at present in use.

I was some time in the last summer, with a number of others, inspecting the repairs of a public building in this town, from the western gable of which (by the way, the part most exposed in our climate to rain and storm) a complete covering of ivy, of several years' growth, had been unnecessarily just cut and torn down, when I observed that this was a most unwise and uncalled for proceeding. At my opinion respecting it, the gentlemen present expressed surprise, saying that it must occasion internal damp; all, with the exception of one, who agreeing in opinion with me, said, that the driest part of his house was that which was many years covered with ivy, and that it was evident this must be the case, as the inside part of the ivy by the wall was covered with cobwebs, and just as dry in the wettest weather as the back of a stove; which, as I then and frequently before observed, was a natural consequence easily accounted for, from the self-evident facts, that the ivy-leaves, hanging one over another from the ground to its highest point of ascent, not only prevents the rain beating against the wall, but carries away the drip from it, and that the small clasping fibres which the ivy shoots into the crevices of the wall to support its ascent, acting like so many roots thirsting for the nourishment of moisture, must draw away any occasional damp which the walls might be naturally supposed to imbibe or attract from the earth or the atmosphere.

In addition to the foregoing observations, I shall merely say, that the wall of the room in which I sleep, which is exposed to the north-west, and was some years since exceedingly damp, being neither externally plastered, rough-cast, nor weather-slated, is for the few last years, since nature has clothed it in a delightful evergreen covering coat of ivy, perfectly dry: nay, even the glass and frame of the upper window-sash, which I suffered the ivy to cover for a year or two, I found, on removing it in the last summer, covered with dry dust and cobwebs, and without the smallest appearance of having ever been wet through their verdant cloak.

Ennis, Oct. 22, 1833.

* Other communications from our intelligent Correspondent would be acceptable.—Editor.

THE EDITOR ON THE SCIENCE OF GARDENING.*

The Hand Book of Gardening, formerly announced, is now published, and we think our readers may be pleased to see how one branch of the subject has been treated, namely, the Science of Gardening; a department which has hitherto been sadly neglected, both in large and small works, and was certainly never before brought at so small a charge within the means of purchase of the labouring classes, and never before brought so level to the comprehension of all. This is saying a great deal; but not, we believe, an iota beyond the facts, as our readers may judge for themselves from the following ample specimen upon the Science of Gardening, which it may be remarked, begins at the beginning by examining the organs through which plants are nourished with appropriate food, as indispensable to their life as to the lives of animals. These feeding organs are in the Hand Book denominated

" MOUTHS OF GARDEN PLANTS.

" Unlike the mouths of animals, which are placed on the upper part of the body, the mouths of plants are placed at the lower part—in the root; though not in the body, nor the crown of the root, but at the very tips of the root fibres.

" At the tip of every root fibre, there is a little mouth, or rather a spongy sucker; and though we cannot discover any opening there, we can always prove that water and other fluids are sucked up by these root tips, which are called *spongelets*, in the same way perhaps as ink is sucked up by a bit of bloating paper.

" The largest spongelets I ever saw were in the root tips of a willow which had shot into a pond at Woolwich. They are also large in evergreens, in gooseberry trees, and in heaths. In the turnip they are to be sought for only in the small fibres at the tail; and care must be taken not to confound the tips of the claspers in ivy with the spongelets, which are always under-ground, and never on the bark of trees, as is ignorantly supposed. Ivy therefore does not, as is supposed, injure trees by feeding on them.

" The openings or pores of the spongelets are so very small that they will admit no liquid thicker than water, and no solid substance however fine.

" It will be obvious from this that all manure must be not only rendered liquid, but also be as thin as water before it can be sucked up by the spongelets; and hence even the drainings of stables and dunghills, which are very rich in nourishment for plants, are too rich, that is, too thick, to pass the small openings till they be largely mixed with water, without which they will choke the crops instead of feeding them. When the leaves become yellow from this cause, they are ignorantly said to be *burnt* by the heat of the manure. In the same way, the finest soot, or the finest powdered lime, bones, or shells, cannot, till dissolved in water, get through the spongelets into any plant.

" It is on this account, that in transplanting, the tips of the root fibres are pressed and obstructed by the earth of their new situation, and are therefore unable to feed till they can place themselves in similar freedom in the earth as they had before transplanting. When they are bent or obstructed in this way, their growth is also prevented, and new fibres spring from other parts of the root, out of the materials which would otherwise have enlarged the old fibres.

" Plants thus acquire a greater number of mouths, the oftener they are transplanted, a circumstance usually acted on by nurserymen, who shift their young trees and other plants for the purpose of multiplying their root fibres, and consequently of strengthening the plants, by giving them a greater facility of feeding. This is also important in cultivating cabbages and greens.

" Every removal, however, must tend to obstruct or injure the root tips, and of course check growth by preventing them from feeding. But by lifting plants with balls of earth so as not to disturb the root fibres, or by taking great care not to injure these, and at the same time spreading them carefully out by hand in their new situation, Sir Henry Steuart, Bart., of Allanton, has introduced the novel and successful practice, founded on science, of transplanting even the largest trees.

" THE SORTS OF FOOD TAKEN BY GARDEN PLANTS.

" The tips of the root fibres, where the mouths of plants are situated, cannot travel about like animals in search of food, and being fixed to one spot, can only take such food as they find there.

" The indispensable ingredient in all plant-food is water, to dissolve the other ingredients, and enable them to pass into the root tips in the same way as the fluid in an animal's mouth is indispensable to mix with solid food when chewed for rendering it easy to swallow. But water alone will not nourish any plant well, as has been erroneously asserted.

* The Hand Book of Gardening, in Principle and Practice, for the Use of Schools and Self-Instruction. Written at the request of J. S. Menteath, Esq., Close Burn Hall, Dumfriesshire. 18mo. Orr & Smith, London, 1834.

" Another indispensable ingredient in plant food is air—the common air, which when mixed with water, as it always more or less is, gives it that agreeable brisk taste that boiling destroys by driving off the air.

" It is on this account that the watering of a garden in dry weather by throwing over it buckets of water from a pump, as I have sometimes seen my neighbours in Kent do, is of far less use than if the pump-water was thrown through the fine rose of a watering-pot, so that each drop might mix with and carry down a portion of air. Rain, again, which falls from a considerable height, must carry down a great deal of air, and hence it is found to fertilize more than any sort of watering by hand.

" When the water supplied to plants has its motion stopped by any means, such as by a stiff clay soil on a dead level, it becomes unwholesome food for plants, chiefly from not having an opportunity to mix with air, which it can only do by moving or circulating freely.

" Soils, where water does not circulate freely, are popularly termed *cold* and *sour*, though their chief defect is the want of a due supply of air. The water of such soils, indeed, tastes vapid, somewhat like water deprived of air by boiling. Too much water in a soil is certainly injurious; but even a rather wet soil will be greatly benefited if all its water be kept in free circulation by judicious draining, levelling, and sloping; or, in the case of stiff clays, by manuring with coal ashes and the like, to open the texture of the soil.

" Besides common air, the water or moisture in garden soils, is always more or less mixed with a substance termed by chemists *humic acid*, or *humin*, which is the chief nutritive ingredient in dung, stable drainings, rotted leaves, peat, turf, and dark coloured loam. Humic acid, however, when pure, will not mix with water, and plants cannot, of course, feed upon it till it be so mixed and thinned down. This is effected by combining humic acid with lime, potass, or ammonia, when it readily dissolves in water.

" The utility of lime, in one point of view, may be thus seen, though it is seldom useful to put much lime on a garden. Hence also we may see the use of the ammonia (popularly called *hartshorn*), which, as the smell fully shews, is produced during the fermentation of urine and dung; and when more of this is produced than the humic acid can combine with, it streams off in a pungent strong smelling vapour, supposed, but without good proof, to be a serious waste and loss as to quantity of plant-food in the fermenting manure.

" All these ingredients in plant-food are composed of a few simple gases, as follow:

" Water is composed of two parts of hydrogen and one part of oxygen.

" Common air is composed of twenty parts by bulk of oxygen and eighty parts of nitrogen.

" Humic acid is composed of carbon and hydrogen.

" Ammonia is composed of three parts of hydrogen and one part nitrogen.

" Lime is composed of a metal called *calcium* and oxygen.

" Potass is composed of a metal called *potassium* and oxygen.

" Potass, lime, and ammonia, are often combined with carbonic acid gas, which is also contained in small quantities in common air.

" Perhaps the most important of all these simple principles is carbon, the chief ingredient in humic acid, and which is nothing else than pure charcoal. It is this carbon that constitutes the greater portion of the solid substances in all plants, while water constitutes the chief fluid portion; and hence hydrogen, which is contained in water, in humic acid, and in ammonia, is so important.

" In order to understand these simple principles well, some knowledge of chemistry would be requisite; but to go minutely into the matter here would lead us away too far from our immediate purpose. What has been here said will suffice to show the nature and general ingredients of plant-food. Those who wish to learn more are referred to the *Alphabet of Scientific Gardening*, and *Alphabet of Scientific Chemistry*.

" The mineral part of the soil, which, exclusive of lime, is composed of clay and flint earth, in the form of sand and gravel of various fineness, together with sometimes magnesia, iron, and a few other metals, contributes little or nothing to the food of plants. These portions of the soil appear to be chiefly useful in dividing and diffusing the nutritive parts arising from decayed plants in natural soils, and from various manures in artificial culture.

" On these principles we can easily account for the barrenness of stiff clays, dry sand, and more particularly soils chiefly consisting of granite sand, as in Arran and near Plymouth; while in the instance of sand or clay from basalt or whinstone, as well as from limestone and chalk, the carbonic acid gas tends to greater fertility, as in the Lothians, Ayrshire, and Kent. No mixture then of clay and sand will be fertile without limestone, chalk, or basalt, that is, whinstone; and more particularly without decayed plants or manures, containing a large proportion of humic acid, and other combination of carbon and hydrogen.

" Some mineral substances are positively injurious, such as iron, and perhaps all the metals, when combined with oxygen or acids. Many good soils indeed contain iron, known by the reddish rust colour it imparts; but in that case they would appear to be fertile in spite of (not on account of) the iron.

" Such is the sort of food which all plants feed upon; and that they require a large quantity of this food, appears from the experiments of the Rev. Dr. Hales, who found that a hop-plant sucked up four ounces of water in twelve hours in a shady place, and eight ounces in a place more open; while a plant of mint, whose roots were set in a tube containing water, made this water fall an inch and a half during the day, but only a quarter of an inch during the night.

" It would appear, therefore, that plants feed most heartily in the day and in open places, being most probably influenced to this by the light.

" Artificial watering may be supposed on this account to be most beneficial early in the morning, just as the plants are commencing their breakfast.

" CHANGES UNDERGONE BY THE PLANT-FOOD.

" As plants have no stomach like animals for the reception and digestion of food, and no moving intestines for carrying through the body what has been digested, the necessary changes similar to digestion take place, first, in the soil without, before the food enters the root tips; and secondly, within the plant, more particularly when the food has reached the leaves.

" The changes which take place in the soil before the food enters the root tips, consist of the fermentation of decaying leaves and other parts of plants, and the circulation of such portions of these through the ground as become mixed with the moisture derived from rains and dews.

" Heat is indispensable for producing such changes, and hence in this climate they do not take place, or at least very slightly, in winter, and in the cold weather of spring and autumn. This, however, is of less moment, as the plants are then torpid, like bats, bees, and squirrels, and take very little food.

" It will follow from this, that when a soil is known to contain rotting weeds and other plants, or has rotted manure spread over its surface, it cannot be too well dug and raked, in order to mix the richer parts of these with the less rich clay and sand; on the same principle that at dinner we mix in eating the richer beef or mutton with the less rich potatoes, cabbage, and bread. Both we and the garden plants must have a large portion of water to thin or dilute the food, otherwise health will suffer. The water which we drink in the form of tea, coffee, or beer, is similar in kind to the manured moisture sucked up by garden plants, which feed solely on liquid food.

" THE SAP AND THE PULP.

" When the water containing air, humic acid, and other nutritive materials, is sucked in by the root tips, and is carried up into a plant, it takes the name of *Sap*. This is in most, if not in all plants, a clear fluid, slightly sweet, the bulk of it being water, but becoming thicker as it rises, probably from mixing with what has been farther changed in the leaves. The milky matter in lettuce and dandelion is not the sap.

" It is not yet known whether the sap rises through vessels similar to the blood vessels of animals, or whether it rises through the tissue of the plant, as ink spreads through bloating paper, or water through lump sugar. The latter is the opinion of some of the highest living authorities.

" It is not of any practical importance, so far as I know, which opinion in this matter is adopted.

" The sap, in whatever manner it does rise through a plant, at length arrives at the leaves in a somewhat thickened state, and is spread out under the very thin skin of the upper side of the leaf, for the purpose of being exposed to the action of the air, in a similar way as the animal blood is spread out for the same purpose in the minute blood vessels of the lungs.

" On the leaves are very numerous minute openings or pores, often smaller than pin-holes, which appear both to admit air and permit the escape of moisture, similar, probably, to the nostrils of animals, or rather to the breathing pores of insects.

" These pores have raised lips, varying in form, which shut when they are wetted, and also in the dark; but open in dry air, and when exposed to sunlight.

" The pores of the leaf lead to small air-cells, which, when larger than usual, form the white or yellow spots on plants with variegated leaves.

" Through these pores the sap gives off two-thirds of its superfluous water, in a similar way as the animal blood gives off its superfluous water by the breath and by perspiration. The third of the sap that remains will of course be much thickened by the loss of so much water.

" This third I call the *pulp*, to distinguish it from the crude watery sap, with which in books it is very commonly confounded. The pulp is of similar use to plants in promoting their growth, as the blood is to animals.

" The pulp, which is chiefly composed of the carbon, or charcoal, derived from the humic acid of the sap, is of a dark blue colour; but the transparent tissue of the leaf in which it is enclosed being more or less yellow, the combination of the two colours forms a green. When no pulp is formed, the leaves accordingly become yellow.

" Several important inferences arise from these facts. The change, for example, of sap into pulp cannot take place in the dark, sunlight being indispensable to open the pores; and hence plants growing under thick trees, or any thing that obstructs the sun's light, cannot well effect this important change, and the pulp being in consequence

only prepared in small quantity, they become slender, yellowish, and sickly, for want of due nourishment. It is ignorantly said that the trees *draw* them.

" Plants in pots in an ill-lighted window suffer the same inconvenience, and bend their heads as much as possible towards the light, not that they have any knowledge of the use of it, no more than a hungry infant has of the use of the milk which it greedily sucks; but because in the part most exposed to the light, a greater quantity of pulp is formed, which renders it firmer, heavier, and shorter than the part less exposed, whose laxness causes it to give way and lengthen, on the same principle that a piece of somewhat moist paper will bend when exposed to the heat of a fire, from the side nearest the fire losing its moisture and contracting. When the change of sap into pulp is in any way prevented, as by shade or by moisture, the leaves naturally become yellow, as when plants in pots have more water given them, in saucers or otherwise, than the sunlight can cause to pass off; or when they are root-bound, and the root tips have not room to feed.

" By tying the leaves of lettuce near the top, the inmost leaves are kept from the light, and hence little or no pulp being formed there, they are rendered white, crisp, and tender; as cabbages and savoys grow of their own accord without tying, though tying will hasten the process. This is called *blanching*, which means ' whitening.'

" In all cases, the more light plants are exposed to, the hardier they will be, provided they be not gorged with too watery food; and the less light they have, the more feeble, sickly, and yellow they will be. Light from above also is greatly better than side light.

" The importance of wide planting in most cases will therefore be obvious; for if potatoes, cabbages, or other plants are crowded together, they become, at least at their sides, nearly as much shaded from the light by each other as if growing under trees.

" AIR.

" The common air contained in the sap when it first arrives from below, is composed, as already shown, of twenty measures of oxygen and eighty measures of nitrogen. At the same time then that two-thirds of the water of the sap passes off through the leaf-pores, a considerable portion of this oxygen is given off; a process that tends to restore to the atmosphere the oxygen consumed by the breathing of animals and the burning of fires. This effect, however, only happens during daylight.

" At night, plants, instead of giving off oxygen, take it up from the air, giving off carbonic acid gas; and hence plants in pots must render bad the air of rooms where they are kept, except during daylight, when they improve the air where they grow.

" From these facts, the importance of a free circulation of air to the healthy growth of plants must be obvious; and hence a garden cooped up between high walls or bushes, even though it have plenty of sunlight, which is still more indispensable than free air, will never produce good crops. It has been supposed by some also, that plants require to be somewhat moved and shaken by the winds, as a sort of exercise for circulating the sap and the pulp, inasmuch as they cannot take walking exercise like animals. This, however, is only an ingenious fancy.

" CAUSES OF THE GROWTH OF PLANTS.

" When the pulp has been formed from the sap by the loss of its water and some of its oxygen, it passes back from the leaf to the branch or the stem; though by what channels is no better understood than those by which it came from the root. ' No man,' says Solomon, ' can find out the work that God maketh from the beginning to the end.'

" As the blood of animals prepared in the lungs by losing water and carbonic acid gas, goes to form or increase the bones and the flesh all over the body; so does the pulp of plants go to form new branches, leaves, and roots, and increase in size those already formed.

" The great use of the leaves will now be understood, as being nearly as important to plants as the lungs are to animals.

" When plants are accordingly stripped of their leaves by accident, such as by the ravages of caterpillars or the browsing of cattle, they either die or become sickly, till new leaves (as will happen in vigorous plants) sprout again to prepare the necessary supplies of pulp. My neighbour's savoys this autumn (1833) were devoured by caterpillars down to the stumps; but I advised him not to pull them up, and they formed very fine little heads in two months. It is therefore an error to pick off leaves, as is sometimes done, with the intention of exposing fruit, such as grapes, to the sun to hasten their ripening; for a supply of pulp is still more important to their ripening than such exposures, and without leaves no pulp can be formed.

" REJECTIONS OF PLANTS AND ROTATION OF CROPS.

" Plants, like animals, do not appropriate all the food which they take; and having the means of separating what is useful, they reject what is useless and put it aside. Independent of the great quantity of water and gases, which plants throw off by their leaves, they also throw out from the roots a sort of excrementitious slime, different in different plants; but poisonous or injurious to the same kinds of plants which throw it out.

" The fact has been long known to gardeners and farmers, that they could not get good crops of the same kinds from the same piece of ground season after season, though the cause of this has only been investigated of late years, and has been proved by experiments of Brugmans and Macaire, not to arise, as was formerly alleged, from the food in the soil being exhausted, since all plants feed nearly alike, but from the excrementitious slime, which acts upon the same sort of plants that produce it as a slow poison. Thus the slime from a crop of cabbages will greatly injure another crop of cabbages, though it will do little or no harm to potatoes or peas; while the slime from peas will injure peas, though it would not injure cabbages or turnips.*

" When this is known, it will prevent two successive crops of the same kind from being tried, unless the ground be so trenched and dug as to bury the slime deeper than the roots can reach. In many parts of Ireland, and probably of Scotland, the slime from potatoes is so mixed with the soil, that a good crop of potatoes cannot be had.

" HEAT, COLD, AND SHELTER.

" Plants, though not so warm as animals, are in general some degrees warmer than the soil they grow upon, and in winter a little warmer than the air. As the heat in animals appears to be produced by the chemical changes which take place in breathing,† so the heat of plants is probably produced by the change of sap into pulp.

" The external heat of the air is indispensable to the due flowing of the sap, and hence it flows very slowly in winter and in cold weather. The stoppage of the flow of sap at the beginning of winter is erroneously ascribed to its descent to the roots at that season.

" As heat then is probably one of the chief causes of the flow of the sap, the artificial heat produced by hot-beds, and also by any sort of shelter, tends to forward the growth of plants.

" Heat is very equally distributed among all things on the earth's surface, by a process somewhat similar to that of water always coming to a level; that is, heat will always pass from a hot substance to one near it which is colder—from the warm ground, for instance, to the cold air, till the heat in the ground and in the air becomes equal.

" Now this off-streaming of heat from a warm substance to a cold one, is as easily prevented as the passage of light by any thing non-transparent; as we have only to interpose something that heat will not easily pass through, such as canvass, flannel, or straw; on the same principle that we prevent the heat of our own bodies from streaming off into the air by means of dress, which will be more or less warm in proportion as it can prevent the escape of animal heat.

" Upon these principles are founded the different modes of sheltering plants, or, in other words, of preventing them from being robbed of heat by the cold air. Shelter will be most wanted in gardens during clear, cloudless nights in spring and autumn; for when there are clouds, they prevent a great deal of heat from streaming off into the upper air, and hence no dew (which is always caused by the moisture or vapour in the air losing its heat) is ever formed on a cloudy night; and the same holds, for the same reason, of hoar frost. As dew will form on the under side of leaves, it is an error to say it falls. Snow acts similarly to clouds in preventing the heat of the ground from streaming off.

" Tender crops, such as lettuce, may be on these principles sheltered during continued frost by hoops bent over them, and covered with mats, straw, or fern leaves. They must, however, always be uncovered during the day in open weather, to admit light and air.

" Rhubarb, and other plants and flowers whose stems die down, ought to have their roots covered over during the cold season with long dung, straw, or silver fir branches, removing these when the leaves shoot up in spring.

" Plants in pots ought on the same principle to be well exposed to light (not side light if possible) and air in the day-time, at least when it does not freeze, but closely housed every night; for the winter nights, even in open weather, are too cold for geraniums, hydrangeas, and other favourite window plants.

" All the preceding remarks apply exclusively to plants which are past their seed-leaf; but the principles applicable to seeds before and after sowing, till they get into their seed-leaf, are so totally different, that it will be necessary to point out the difference.

" SEED SOWING.

" Every seed has a shell, more or less hard, to protect it from external injury, and at its base what is called the seed-pore (popularly the *eye*), for the passage inwards of the nutrient pulp before it is ripe, and for the passage outwards of the young plant after sowing.

" Within the shell is the kernel, consisting of the embryo plant, with its radicle or root, its gemlet or stem, and the neck between these, besides the seed lobe or lobes, containing materials for nourishing it in the first stage of growth.

" In order to begin the growth of the embryo,

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* See the details of M. Macaire's Experiments, Field Nat. Magazine, December 1833.

† See *Alphabet of Scientific Chemistry*, p. 105; and *Alphabet of Zoology*, p. 85.

four things are indispensable; heat, water, air, and darkness.

"The heat is required to soften the nutrient materials in the lobes, but without water it would be more likely to harden these. Pure water is more advantageous than water containing humic acid or other rich materials, what is contained in the lobes being sufficiently rich.

"Freely circulating air is indispensable for supplying oxygen and carrying off carbonic acid gas, a process the reverse of what takes place in leaves exposed to sunlight. For the same reason, light is injurious, by carrying off the oxygen requisite in this stage of growth.

"In sowing any sort of seed, these four circumstances must be carefully attended to. For want of heat, accordingly, seeds will not come up during frost; for want of water, they will not come up when sown in dry sand; for want of air, they will not come up if too deep in the ground; and if not duly covered, they will not come up from having too much light.

"Most seeds are benefited by steeping them for an hour or two in pure water, which in the cold weather of spring may be made milk-warm. Pickles, train-oil, urine, and other steeps, must in most cases be injurious, and will never, as is ignorantly pretended, kill the eggs of insects, even if such be among the seed, of which I know not a single instance.

"Too much water, however, will be certain to injure the seeds, by gorging them and rendering them dropsical and liable to rot. Hence the well-known benefit from sowing in dry weather, to insure only moderate moisture.

"The seed-lobes, when in part exhausted of their nutrient matter, are changed into seed-leaves, and go on to prepare pulp from the sap now taken up by the young root.

"The seed-leaves are now therefore so important to the very existence of the plants, that when they are eaten off by insects, as is done to seedling turnips, radishes, and cabbage, by the turnip-fly, the crop perishes.

"METHODS OF MULTIPLYING PLANTS NOT BY SEED.

"The most common way of procuring a great number of plants of one kind is by sowing seed; but some plants, as the foreign geraniums and most double flowers do not ripen seed; others, as the rose, the seeds take as long as two years to come up, and several years after to blow; and in others, the plants from seed are very different from the parent plants. These circumstances have led to other methods of multiplying particular kinds, as follow:

"DIVIDING THE ROOTS.

"Every root has what is called the crown or neck, and in some roots, as the potatoe, a similar part is called the *eye*, attached to which is the body of the root, with the fibres and their feeding tips or mouths.

"The crown, neck, or eye, is in most roots the only part of a root that can send up a stem. The exceptions to this are the roots of mint, horse-radish, iris, Jerusalem artichoke, and a troublesome weed in gardens called ash-weed, from the leaf resembling that of the ash, the least bit of all which roots will grow; because they seem to be rather under-ground stems than real roots.

"It will follow, that with these and a few other similar exceptions, roots will only be capable of being divided, when they have more crowns or eyes than one, as in the small bulbs that grow at the base of the larger bulbs in lilies, daffodils, tulips, and snow-drops; the eyes in potatoes, rhubarb, dahlias, and peonies; the crowns in primroses, auriculas, sea pinks or thrift, and double rockets; and the side branches in border-box and carnations.

"The crown or eye ought to be cut with a sharp knife, so as not to tear or bruise the parts; and should if possible have both a piece of the body of the root, and also some fibres with their tips uninjured. This, however, is not indispensable, for the crown or eye alone will often grow without any fibres at first, as in auriculas; though the fibres will in no case grow without any part of the body attached to them.

"SEPARATING OFFSETS, LAYERS, AND SUCKERS.

"Many plants, instead of having a number of crowns or eyes, have only one, and send off short stems, like the daisy and houseleek, or larger runners, like the sweet violet, ground ivy, and the strawberry, with young plants at the end, which readily take root, and may either be allowed to root after cutting the runner, or, if it is required to make them rather stronger, before the separation.

"The time for doing this must be in some measure regulated by the growth of the offsets, and by the season of the year; for it will in all such cases be important to have the young plants well rooted a month or so before the setting in of frosty mornings in the autumn.

"When the offsets are not naturally fitted to take root of themselves, as in the carnation, an operation called *layering* is performed, which consists in interrupting the passage of the pulp downwards by making an upward slit with a penknife half through the stem, and by several other methods; then fixing the cut part a little under-ground with a hooked peg, when root fibres will form, and the rooted

layer may of course be removed and planted elsewhere.

" Many other plants, such as double wallflowers, lilacs, honeysuckles, roses, sweetbriar, laurels, and most evergreens, may be layered in a similar manner, it being a very certain as well as an easy mode of getting a number of plants.

" The young plants called *suckers*, which spring up from the deeper roots of some shrubs and trees at a distance from their trunks, as in the currant, gooseberry, rose, lilac, and plum-tree, may be taken up with a bit of root (with root fibres and their tips if possible) attached to them. These however will take nearly as long to come into bloom and bearing as plants raised from seed, and in this respect are inferior to layers from the older branches, which usually blow soon.

" In the monthly rose, suckers make the best plants, as they do also in the sweetbriar; but this does not produce many. Such suckers, when long and easily bent, may also be treated as layers; and as many new plants may be obtained as there are buds on the sucker, by making a ring-cut through the bark below each bud, and laying over the whole sucker when pegged down a shallow covering of rather dry earth, when a stem will rise from each bud, and roots grow from each ring of bark that has been cut: a good mode of multiplying rose-trees.

" STRIKING OF SLIPS OR CUTTINGS.

" The younger twigs of some plants and shrubs, and even large trunks of such trees as willow and elder, when planted in the ground, will continue to live almost as well as a layer attached to the parent plant, till they acquire root fibres; and in this way many plants are multiplied.

" The success of this process depends on the end of the slip or cutting not being too young and soft, otherwise it will become gorged with moisture and rot; in its not being too old and hard, otherwise it will not take up moisture enough to keep it alive; and hence, when possible, the end should be cut with a slope, so as to have one side rather soft, and the other rather hard, taking care not to bruise the bark nor leave it ragged. For the same reasons, both a very moist and a very dry soil will not answer, though the last, and even pure sand, is preferable for delicate plants, with frequent gentle waterings, so as not to gorge and rot them.

" As the life of cuttings must be somewhat feeble till roots are formed, they ought not to have much light, and may be slightly darkened by a bell-glass, nor many leaves and no flower-buds left on to exhaust them; and, as has been said of seed sowing, they ought not to be planted too shallow, for roots dislike light; nor too deep, for roots cannot do without air.

" The ease with which cuttings of currant, gooseberry, and monthly rose trees, southernwood, geraniums, thyme, sage, and many other plants grow, is known to every body, and extensively practised at haphazard, without knowing the principles just stated; and, consequently, when the same method is practised with the moss-rose, sweetbriar, myrtles, double yellow wallflowers, and other plants more difficult to *strike*, as it is termed, no reason can be given for disappointments. Perhaps, however, there are no plants that may not be successfully struck by cuttings, if care be taken to nurse their enfeebled life, by excluding bright light and preventing engorgement till they can form roots."

These principles are in the succeeding parts of the book applied to the practical parts of kitchen, fruit, and flower gardening; and the whole is concluded with a Calendar of garden work to be done in each month of the year.

ON RUST IN CORN.*

BY M. STANDINGER, FARMER AT FLOTBECK, NEAR HAMBURG.

Cultivators, all over the world, attribute rust to the influence of a malignant dew, or to what is termed blighting weather. This opinion, however, is not less erroneous than that of those who attribute it to the vicinity of a barberry bush (Berberis vulgaris). Professor Hornemann, of Copenhagen, planted some corn in a garden, and surrounded it with barberry bushes; this corn was not attacked by the rust; the experiment repeated several times always produced the same result. Since the proscription of the barberry, the rust appears not less frequently; of this, the year 1830 is a proof.

The author thinks that rust may be attributed to the re-union of many causes: such as the nature of the soil, too vigorous a vegetation, a sudden change of temperature, and continued drought or rains.

The following are the facts which the author has cited in support of his opinion

During fifteen or twenty years, the tillage of the environs of Altona has furnished a proof that an exuberant vegetation may become the cause of disease. The herring fishing produced so abundantly at the mouth of the Elbe, that the fishermen laden with these fish returned up the river and offered

* Oken's Isis, 3rd for 1832, p. 262.

them to the peasantry at so low a price, that the latter bought them for manure; some of them mixed it with a certain quantity of good earth, and obtained a fine harvest, especially on sandy soils: others covered their fields with these herrings, and were much astonished at finding the wheat and oats attacked by rust before the ears were formed. Cold lands produced only a moderate crop. Potatoes thus manured, at first grew very rapidly; their leaves were of a blackish grey, and in November they were besprinkled with spots of rust; the storks under-ground produced only small abortive tubercles, which were also covered with spots of rust.

Those who had manured their meadows with a mixture of earth and herrings, gathered a good crop of hay, but the grass was invaded by the rust as soon as it reached a certain height. In 1830, the same phenomenon was observed on all sandy soils. Having been sufficiently watered, they were covered with magnificent corn which were soon devoured by the disease.

A previous observation serves to support this theory. In 1794, the author went on an agricultural journey through Holstein. The division of property had been lately adopted, the produce of agriculture was rising in value, and the cultivators loaded their land with manure, bestowing no other labour on it. It was then observed that the corn was pressed down, and rust became more frequent from year to year, while the luxuriance of vegetation of the corn increased. The peasantry in the neighbourhood of Hamburg and Altona attributed the rust to the introduction of the potatoe. In this opinion they were both right and wrong, for this reason: the Dutch had formerly monopolized the sale of potatoes, and exclusively furnished the marshes of Hamburg with them; but when they began to cultivate the blue flowered variety, called Dutch, they could no longer support the concurrence, and the price of corn having at the same time considerably increased, the farmers began to manure their lands to excess with the mud of Altona and Hamburg, and thence the rust was introduced into their fields. Thus may be explained the coincidence of the introduction of rust with the culture of potatoes, without any direct reference to cause and effect.

A NEW WAY TO GROW EARLY POTATOES.*

On walking out the other afternoon, in company with some friends, we were caught in a thunder-storm, and obliged to take shelter in a farm-house, the owner of which was known to one of the party. During the storm, the conversation turned upon gardening, and our host gave us a plan for raising new potatoes, which I send you. It may appear strange, but, as he says, he has tried it, and found it to answer very well. At all events, I think it worthy of consideration and a trial. I will give his own words, so far as my recollection serves.

"I was getting up my potatoes one year, in that field below the house, when the thought struck me, that by planting the smallest of them again, immediately, they would grow, and I should have new potatoes very early. I resolved to try the scheme. I had no hot-house or green-house, and was therefore obliged to hit on a plan for keeping off the frost, which I did as follows. I chose a part of the field in which I was working, and made trenches along the top and sides to keep it dry. I then covered it a few inches deep with litter, put on a few inches of soil, and planted the potatoes, covering them again with soil. In order to keep the earth from falling down and smothering them, when they began to shoot, I stuck sticks and brushwood over the last layer of soil, and put on a quantity of litter, covering the whole with soil. One of my neighbours, who saw me, was surprised, and said he was sure I should have nothing in the end; but I told him to come again on new year's day, and we would see. We did so, and we opened the bed and found new potatoes about the size of a marble; I then told him I would leave it until the 6th of March. I did so, and on opening it again, the new potatoes were as large as an egg, exceedingly well tasted, and quite mealy. I showed some to the gardeners in the neighbourhood, who would scarcely believe me, when I told them how I had grown them."

The situation in which they were grown, and which I myself saw, was on the north side of a hill, in the northern part of Lancashire, not the warmest situation in the world, as you may imagine.

The idea of growing potatoes in the manner above stated is good, but my informant's mode is, I think, capable of improvement If, instead of the side of a field, an old hot-bed were used, and hoops placed so as to prevent the soil from falling down and pressing on the young shoots, which would not grow very high, as potatoes when deprived of light do not grow so much above-ground as they do naturally, I think early potatoes might be raised without any expense. I intend to try it, at all events, and hope some of your readers will do so likewise.

* From Hort. Register.

5

Melanthium viride

6

Hedysarum roseum

7

Cyclamen Nedeœfolium

8

Thea Chinensis Var Bohea

Poinciana pulcherrima.

Pelargonium pulchellum.

Phyllodoce Taxifolia.

Diapensia obtusifolia.

Vaccinum buxifolium

MR. WALLIS'S DENDROLOGY.*

This is a very singular book. It is the production, as we have been informed, of an old man who has been successively a common sawyer, a feller of timber, a milkman, and a timber surveyor, who can, moreover, do little more in the way of letters than subscribe his own name to an account for work done. He boasts in the preface (page vi.) of never having read any work on botany in his life (for the best of all possible reasons, we guess), for which, he says, he was praised by no less a person than Sir Joseph Banks; it being hence obvious that the President of the Royal Society deemed botany useless to a practical man like Mr. Wallis.

The work is creditably written, notwithstanding the *sine eruditione* of the author, who scruples not to quote Latin; but it contains such strange doctrines, that our readers might suppose it more likely to be the production of a closet dendrologist, who had never seen a tree, than of a practical man. Such anomalies however now and then happen, the practical man stepping out of his beat to wander into the mazes of theory. We had in a former number a striking instance of this in Mr. Main, who fancies the life to be a particular member of a plant; and here we have a still deeper plunge into theory, for Mr. Wallis maintains that the root is not essential to the nourishment of plants at all. It is very obvious he might as well maintain, that his own mouth is not essential to convey food to his stomach. Here are his conclusions from a few facts stated in the first twenty-two pages.

"From the various specimens and experiments already laid before my readers, they will be able clearly to deduce, that trees possess the following properties:—

"First,—That trees that have been felled in winter, can, nevertheless, produce leaves and shoots in spring, as if growing in their natural position in the earth.

"Second,—That trees have their bark full of sap in activity in the spring, although felled in the winter of the preceding year.

"Third,—That trees that have lost their bark from the trunks, can produce fine heads, and live many years, and even throw out shoots,—a circumstance which has been more particularly observed in limes, elms, and thorns.

"Fourth,—That trees that have been ringed, and have at that part had their liber scraped away, can still produce heads and leaves, and a greater increase in the portion of their trunks above the ring, than they would had they been left in a state of nature; whereas, no increase or growth ever takes place in the trunk below the part ringed;—on the contrary, it prematurely, though slowly, dies.

"Fifth,—That the branches of trees continue to live, to be supported, and grow, after both trunk and bark have become rotten.

"Sixth,—That branches possess the property of forming bark, and bark the property of producing boughs and roots, some of which latter are often found projecting and hanging down from many feet above the earth, and even growing into the trunk again,—for each branch is perfect in itself, and independent of its trunk.

"Seventh,—That decayed trunks grow heads as readily as sound trees; and that so also does the mere shell of bark, which is well shown by some aged elms in Hyde Park at this time.

"Eighth,—That bark from the branches grows downwards, covers and shields, or heals over, that part of the tree from which limbs have been lopped; and that the upper portion of a trunk can re-produce bark, and project it downward, and recover parts stripped of their bark.

"Ninth,—That the head of a tree can live, thrive, and produce, when suspended in the air, and even after its own trunk has entirely rotted away.

"Tenth,—That a tree will even continue to live, to grow, and to produce leaves, buds, blossoms and fruit, for years after its trunk may have been divided, and all communication with the earth completely cut off.

"Eleventh,—That gooseberry and other trees will grow and produce roots when inverted,—their branches set in the earth, and their roots projecting up in the air;—and that the vine, the ivy, &c. will produce roots or shoots, at either end of their branches indifferently, or from any knot in their structure.

"Twelfth,—That trees continue to live after their roots have rotted away; and without branches when all of them have been cut away,—as in the instance of the withy.

"Last,—That shells, with bark, can re-produce roots, woody fibre and heart, and, in fact, nearly constitute itself a new tree; and so, inversely, can roots.

"If, after the facts already related, and especially after the ringing, and thereby the destroying of the vessels supposed to have the only power to convey the sap from the root to the extreme ramifications,—I say, if the upper part do still continue to live, and to receive a due supply, nay, even to grow more luxuriantly, whilst all parts below the ring, and its bark and roots, die,—I say then, this

* Dendrology, &c. by John Wallis, Timber Surveyor. 8vo. London, 1833.

proves, beyond the possibility of a rational doubt, that the juices, or immediate causes of continuation of life and circulation, are conveyed through other channels than the roots, or upwards through the stem,—and which position is satisfactorily maintained by the very extraordinary fact, that, with due precautions, you may cut through the trunk, or remove the bark, and yet that the portion of trunk and branches of the tree above the division will live, increase, and produce, for years after such disseverance. The roots themselves may rot away, and yet the trunk can live on and form new roots.

"Now, as the trunk possesses the power to live without its roots, so ought the correspondent part, the plumula of the seed, to possess the same power; and I have ascertained, by the following experiments and many others, that it does.

"I removed the caudex from the plumula of a growing pea; yet the plumula lived on, and grew to six times the size it had attained prior to the removal of its caudex; and this happened in spite of the cold temperature of the present March, and the germination being caused to take place out of its natural season.

"It therefore manifestly appears to me, that the opinion of the botanists,—viz. that an acorn, (seed, or the like,) when germinating, must 'first strike down a root,' or radicle, for the support of the plumula,—is an alogy! a perfect non-sequitur! And in manifestation hereof, a pea (or other seed) put into water, germinates; and by the time the pericarpium bursts, the plumula is in existence, and a caudex, not furnished with radicula, is thrown out; and both the caudex and plumula are supported for days after this by the cotyledons of the seed alone, and not by the caudex: and nearly twelve days will elapse from the commencement of germination before a single radicle is formed.* Now, very long before this period the plumula will have shot out, have erected itself, partly have expanded its leaves, and doubly outgrown the size of the very caudex itself,—which by the botanists is said to be the means of support,—and at least one half of that caudex will generally by this period have withered, and its end be twisted upwards.

"The radicles are now about formed, and sent out by the remaining portion of the caudex, or immediately beneath the base of the plumula, or by the plumula alone; and then, indeed, when the caudex has been furnished with the remainder of its parts, i. e. the radicula, can we say the radix is complete, and not before.

"The caudex is at times but partially, and at other times not at all, developed† during the process of germination; and yet just as vigorous a plumula is formed, and as fine a plant is produced, as if the caudex had been first projected from the seed.

"And hence I maintain that it is the corculum itself that has the power of propagation and support before the radicle is in existence, and that this power in the corculum is first exerted to complete the plumula, and then the radix; and that if it fails in this its primary object, the radicle will not be projected at all, nor will any plant be formed; but, on the contrary, the caudex may be pinched or cut off,‡ and yet the plumula may live on and produce the plant.

"The former theory in explanation of this subject by the botanists, is looking to a secondary cause for a primary effect, which is alike contrary to fact and reason; and I ask, If the corculum and seed or pea, have the power to form, and give support for a time to both the plumula and the radicle, why should it be thought incapable of supporting for a time the plumula alone, which requires but a smaller portion of this acknowledged power?

"Having collected, brought forward, and related in the foregoing part of this work, reasons, experiments, and proofs which, I think, are more than sufficient to overturn the theories and the received opinions, that the roots are the way and means, or channel, or conduit of nutrition from the earth; and that the radicle is the primary support of the plumula,—I shall proceed to describe a more simple theory, founded too on a more simple process, by which I think a tree really lives, and by which it carries on its circulation, and whereby I get rid of the difficulty of fluids rising against gravity: viz. by showing that the sap and juices descend, and therefore are generally assisted by that power; and thus will the theory be simplified, and anomaly got over, and all be more in unison with the general law of Nature,—omnipotent, omniscient, all-marvellous as she is.

"It is well known to the physiologist, that Nature ever adopts the simplest means to effect her purposes: and therefore it seems more than probable, where extravagantly complicated means appear to be employed in producing complicated effects, that we are totally in the dark as to the true *modus operandi*."

On the subject of training we have the following remarks, which we leave our readers to appreciate for themselves.

"As all trees receive, as I have proved, their only nutriment—the sap—directly through their top or head, it is evident that a tree, intended to grow fast

* "Is not a sufficient example of the above fact exhibited, by a slip or cutting having the power to throw down a root? for 'each branch is perfect in itself,' as is truly set forth in the Scriptures.

† "This latter circumstance occurred in two instances out of a few germinating peas.

‡ "This experiment was made several times, and with similar success.

and produce good wood, should always have the largest possible quantity of head left for its support; never forgetting that it is the top and leaves alone that prepare and transmit the sap and nutriment. I can safely assert, that one half the timber grown in Great Britain is utterly spoiled by inattention to those valuable rules, and which have been drawn from a thorough knowledge of the descent of the sap.

" The gardener, alike uninformed on this practical point, and acting upon the old received, but mistaken, belief, viz. that sap rises from the roots, is led to remove even the last year's shoots, and to cut away too largely from the heads of trees: and the reward of this false theory and practice is, that his constant care and labour will invariably lead to a very diminutive crop; and the fruit so produced will always be found less in size than the same trees would have borne had they been properly pruned, or even left wild.

" As a general rule, then, no fruit-tree should be cut or pruned, or leaves removed, except during the months of January, February, and March; and the common practice of cutting wood and removing leaves at Midsummer, when the tree most needs support, is highly improper and injurious, and savours of ignorance.

" I made the following experiment in exemplification of this point. The vine of a next-door neighbour grew up the back of the house. I begged leave to train over the party-wall some few of the branches. I carried them horizontally along my wall above a window, and the first year they bore little or no fruit. I let them grow on without cutting any part from them until the next winter; then I cut off the wood I did not wish to train up. In the following year I found these branches grow luxuriantly, and throw out more fruit. I again let them go without pruning until the third winter. In the following season I had an immense number of bunches produced, considering the size of the branches. My neighbour, who pruned his part of the same tree at Midsummer, and who had almost the whole vine, and in the same aspect, had not six bunches of his grapes that weighed so much as some one of mine. I possessed many bunches (of these white cluster grapes) a pound and a half each in weight

" But to conclude the subject of decay in timber, I may state, that when a large portion of bark is injured or bruised, it dies, and after a time falls off, and then the surface of the wood, called sap-wood, remains exposed. This part of the trunk is white, but has within it a deeper-coloured part, called the heart-wood, and this is most distinct and best seen in oaks and elms. The bark will cover over the surface of this defect; but, nevertheless, the white wood, called sap-wood, is invariably found decayed when the tree is converted into use. Yet it should be observed, that underneath the bark that grew over the injury, new sap-wood will be produced the following year under the bark, and over the old decayed wood that had been exposed; and even new heart-wood will in time be formed exterior to the old rotten portion of wood, which the year or two before, viz. at the time of the injury, was the outer portion of the trunk, but which has now become the inner portion of it. So complete in their formation are these new-deposited parts upon the old trunk, that no observer, after a time, is capable of seeing any defect in that portion of the tree from without. This fact is too well known, and to the cost of the timber-merchant, who frequently purchases such trees as sound, but on converting them into use, finds himself considerably out of pocket, in consequence of such portion of timber not being fit for the purposes to which he had designed it.

" A similar defect is also produced when the bark is removed from the roots, and they themselves have become rotten. This is the cause of hollowness towards the bottoms of trees; and the roots first decay, and then are soaked by water abundantly, which gradually finds its way up the trunk. From this cause I have often observed trees to become rotten to the extent of twenty feet from their base. Such old shells will frequently be seen to put out new roots, and to re-produce branches, which thrive and grow much quicker in proportion than those of young and sound trees, as there is no longer a trunk to be supported.

" When roots decay without mouldering away, they, by conducting wet for many years, produce red or foxy timber, which is totally useless, for, although it looks sound when cut, on exposure to the atmosphere it soon completes this incipient decay, and moulders the timber into dust,—a circumstance by which ship-builders are much annoyed.

" Decayed roots, above thus spoken of, are most frequently met with in those trees that have lived long enough to become feeble, and to have lost the power of sufficiently supplying their roots with sap, which is reason sufficient to account for such frequent decay of root and base in the same tree. We most frequently find this peculiar red timber in trees that have grown upon stubs, and on that side of the tree on which the roots have died, and also on that side of the tree on which no new roots have since formed from the bark.

" The decaying portion of old root always leaves a vacancy, by which air and moisture enter the trunk and destroy it. If such trees be cut down soon enough, the timber is scarcely injured; but if cut late, it is found to have become red; and if allowed to stand still longer, perfect rottenness will invariably be found to have ensued.

" I have now proved, to the satisfaction, I trust,

of my unprejudiced readers, the various positions I advanced in the course of this work; and I hope I have clearly shown that trees and vegetables do not receive their sap or nutriment from the earth, but that it only serves to prevent the evaporation from the roots, imparts warmth, and acts as a fulcrum! I have shown in the second chapter that the leaves prepare the sap, and that the bark conveys and circulates it, and that its course is invariably from above downward, through the trunk, and so onward to the roots, when any exist: and I have set forth a rational method of pruning, founded on the above knowledge; and I have shown how decay may be prevented, and a larger quantity of sound timber grown."

ON EXCRETIONS FROM THE ROOTS OF PLANTS.

BY MR. TOWERS.*

I SHALL state the facts which led me to the opinion that I formed about four years since, and in which I have been confirmed by repeated subsequent observations. It was notorious that many crops could not be made to succeed, if repeatedly placed in the same individual portions of ground. Manures were found ineffectual; and, therefore, the deterioration of the crops could not proceed from a want of sufficient aliment. The necessity of a rotation was observable chiefly in the farm; still, however, the garden afforded many instances confirmatory of the fact. As I was writing solely upon the produce of the garden, it occurred to me, when treating upon the singular and sudden deterioration of the raspberry, that to the same causes which produced the destruction of a fruit-bearing shrub, might be ascribed the debility that ever followed the successive repetition of a corn-crop upon the farm. I had observed that the soil about the roots of the raspberries acquired a peculiar colour and texture; it differed from that of any other soil of the garden: manure was freely applied, and still the plants became weaker, shorter in growth, and less fruitful. I did not know the age of my plants, because the bed had been formed before I came into possession of the ground; but I really ascertained that plants of the white Antwerp variety, which I purchased and placed alongside of an outermost row of the bed, would not take to the soil; and about the period that the whole had become almost worthless, I saw several remarkably fine plots of the shrub, and conversed with the owners, from whom I learned a variety of facts, which, though detailed in the plain, unphilosophical manner of cottage gardeners, led me to conclude that the raspberry plant deposited feculent matter in the soil, which, after a certain period, rendered the soil utterly unfit to support the shrub, and enable it to produce fine fruit. Reflection and recollection, at the same time, informed me that a variety of vegetable crops imparted a manifest odour to the soil; so much so, that in digging up a crop, the whole plot was perceived to be imbedded with a specific aroma. I confirmed these facts, and then wrote the passages that I have quoted in the early part of this article. Subsequent observations, and much experience, have confirmed the opinion that I then noted down; so that the reader may rely upon the correctness of the following facts. When peas are sown in pots or boxes, with a view to future transplantation into rows or plots, the vessels become replete with matted roots. Upon removing the peas to their place in the garden, the soil they grow in is found to be completely saturated with odorous matter; it emits a powerful peculiar smell, that cannot be mistaken. The kidney-bean (Phaseolus) produces a similar effect, but the odour differs from that of the pea: the same may be observed in plants of the leguminous tribe in general; and I have little doubt that this tribe will be found particularly to require a frequent change of situation. I have already referred to a well-known effect produced by the pea upon the shallow, loamy soil, of that eastern part of Kent called the Isle of Thanet; and the experiment of M. Macaire with the bean (Vicia Faba) is in accordance with, or at least may be adduced in support of, the facts named above.

The Brassica tribe, cabbage, brocoli, &c. also impregnate the soil with a marked and peculiar odour.

From whence do the gases which produce these effects proceed? Many, perhaps, will be inclined to suppose that it is not the soil which gives forth the smell, but the root itself; but how can any plant retain within its substance an odour that is externally sensible? If a flower, a rose for instance, be held at some distance from the nose, the specific aroma of that delightful flower becomes manifest; but could this be the case if the rose did not emit the gaseous vapours which disseminate the odour? Whatever it be that yields odour or scent, whether that be agreeable or offensive, must be material, because it produces a positive effect upon one of the senses; and, moreover, the odour of flowers is very

* From the Quart. Journ. of Agriculture.

frequently productive of faintness and debility! If the roots of a plant radiate odour, the earth about them, being the medium in which they germinate, must receive the odorific matter; and, in fact, a spade can scarcely be put into a plot of soil that has borne a crop of some vegetables, without liberating, as before stated, a volume of vapour sufficient to be discerned, at the distance of a foot or more, above the surface.

Again, if soil be perfectly fresh, that is to say, raised from the depth of two or three feet below the surface, it will generally be found of a different colour from the old worked soil of the garden or field. A hazel-loam, which is a combination of sand, aluminous and chalky impalpable matter, coloured by oxide of iron, is frequently found at the depth mentioned, and may be considered pure virgin earth. If such soil be planted with strawberries, or almost any vegetable crop, its colour will undergo a change, and become many shades darker. Is this change of tint effected by carbonaceous matter excreted from the roots, by the partial de-oxidation of the ferruginous constituent of the earth? The latter may probably operate to a certain extent, but I hold it more philosophical to conclude that the change in colour is to be ascribed to hydrogen gas (holding, perhaps, carbon and other matters in solution), emitted from the roots into the soil, and therein effecting chemical decompositions by specific elective, or rather electric attractions.

This blackening of the soil may be suspected by some to proceed from the decomposition of carbonaceous matters; and it is highly probable that it does so proceed; but even admitting that manures have been placed in the soil, their decomposition and absorption, according to the received opinion, by the roots of the crop, ought to abstract the carbon from the soil, and not to deposit it therein! But I am supposing a case wherein pure virgin sandy loam, without manure, is employed; and, to simplify the experiment, I say—let a middle-sized garden-pot be filled with such soil, and in it let a single vigorous strawberry-plant be placed in the month of February, and be regularly watered; by the end of August following, that is, about the period when the growing season is almost passed, the soil will be found of a deeper colour, by many shades, than it exhibited when placed in the pot.

My experience has taught me this fact, and I ascribe the effect to the matter emitted by the roots into the earth. Earth so coloured is not, I conceive, exhausted; it is doubtless changed, and in time would be incapable of supporting the vegetation of the plant which had deposited the colouring matter within it, but in respect of mere abstract quality, it is unquestionably richer than it primarily was, having received more than it gave out, and this, in fact, manure for another species of vegetable.

This is in accordance with the very valuable experiment of M. Macaire, which indicates that yellow colouring matter was afforded by the bean to pure water; which yellow matter was taken up by "plants of wheat," that "lived well," and afforded evidence of having "absorbed a portion of the matter discharged by the first" (the beans.)

My own reflection, and the observation of facts, have satisfied me that certain plants do emit hydrocarbonous compounds into the soil, that poison it, inasmuch as refers to themselves individually; but such experiments, as those of M. Macaire, are invaluable, and ought to be persisted in, in conjunction with daily observations of the soil of the field and garden, till the facts in all its bearings be established. I for one intend, if life be spared to the next spring, to follow the advice to "prosecute those interesting investigations" as far as the means within my command will permit, for they can scarcely fail to lead to important results.

It remains to be observed, that the doctrine of the excretory powers of plants does not strictly apply to all vegetables; at least, it is manifest that trees and many shrubs will live on, and improve in, the same piece of ground for an almost indefinite period.

Many garden vegetables furnish also exceptions to the rule, and I particularly notice the potatoe. In fact, the experiment of M. Macaire seems to afford evidence that this vegetable does not secrete matter of any decisive character. I know those who have assured me, that potatoes have been set for ten or even twenty years on the same land, with little or no other manure than coal-ashes and the scrapings of road-sand. This sand was, in the county I allude to, obtained from the calcareous stone of the neighbourhood, and it proved a powerful meliorating substance to the cold clayey soil of the district.

I venture to suggest, that grain and other crops, which expend all their vegetative energy upon the production of seed-vessels, are less likely to protrude matter from their roots than other crops which abound with large bulky foliage; they, therefore, cannot prove manure crops for their con years, although they may render the soil unhealthy to themselves individually. With respect to the potatoe, I think it evident, that its foliage elaborates much vegetative matter, a large portion of which is expended in the production and support of tubers under ground. These tubers are not the roots proper, but enlarged processes, the depositories of much nutritive matter. It is highly probable, that the plants which produce bulbs, tubers, or spindle-roots, whose foliage is abundant or very large, will in general be innoxious to themselves, at least comparatively so, in consequence of the absorbent powers of their bulky root processes. They will

in proportion also be of little service to corn or other crops, unless much manure be previously applied. In a word, the vast foliage which they develope, must claim a great supply of raw sap from the soil. This, or the prepared portion of it, is returned with interest to the roots, but it is then diverted into peculiar channels, and is employed in the production of those processes that constitute so large a portion of the food of man and of cattle. The bulb or tuber-bearing plants are generally but indifferent preparers of the soil for other crops, for they must exhaust its decomposable materials; but they may be grown (though not to full perfection perhaps) on the same ground without becoming diseased. Such, I think, will be found to be generally the fact; and this, as far as the experiment goes, has been confirmed by the observation of M. Macaire.

From all that has been said, it is, I think, fair to conclude, that, although plants decompose and take up nutritive matters of the soil, and render manuring indispensable, yet it is not by exhaustion that a soil is rendered unfit for a repetition of an individual crop. Facts in abundance might be multiplied, in order to prove that a rotation is called for, in consequence of the feculent matter previously deposited affecting the nutritive power of the soil in supporting any individual crop.

ON THE CULTIVATION OF MANGOLD WURTZEL.

BY MR. RYAN, GARDENER AT KILLAKEE-HOUSE.*

The cultivation of the mangold wurtzel appears to retrograde rather than advance in this country; so that if our apathy to it continue much longer, the term under which it was originally introduced, "the root of scarcity," will be as applicable to it as ever. It has been cultivated in this country to my own knowledge for about twenty years, in which time it has been grown on every description of ground, from the deep black bog to the sand and gravelly hill, where the soil is not four inches deep. It however requires, in order to attain its greatest degree of perfection, a deep, fresh, friable loam, on a dry substratum; in such, when in good heart (and if it be not, it must be rendered so by manuring with rotted dung, such as what is called scavenger's dung, in Dublin, and may be had there in any quantity, at from six-pence to ten-pence per ton), I have seen it attain the enormous weight of twenty-six pounds. But on a large scale, when judiciously treated, I have known the roots to average five pounds. This, supposing the drills two feet apart, and the plants a foot from each other in the lines, will produce the astonishing weight of seventy-five tons per Irish acre. I am aware that such crops are seldom had; but I may appeal to every grower of this root on good ground for the truth of the above statement. This, one would think, would be sufficient inducement to extend its cultivation, particularly as we know there cannot be a more acceptable food for cattle, nor one on which they thrive better, nor give more milk.

The cultivation of mangold wurtzel is extremely simple, and not liable to the casualties attending a turnip crop, there being no fly which appears to affect it. The ground should be deeply ploughed, and rendered as friable as possible with the brake harrow; it is then to be thrown into drills about two feet apart, in which rotted dung, in quantity according to the wants of the ground (the more dung the better), is to be placed and covered as for turnips; a roller is then to be drawn over the ground, and the crown of the drill opened to receive the seed—this I have usually performed with the corner of the common garden-hoe, but have latterly applied a little implement which I got at your brother's establishment, and which I think he called a souflet, to that purpose, which I find it performs admirably. I have sketched it as if lying on the ground, and have shewn the opening into which a handle of about four feet in length is inserted. It was recommended to me for stirring the ground amongst vegetables, or else for drawing drills in a garden, which it also does very well. A man opens a drill with this almost as fast as he can walk; and the drill is effectually covered by drawing the same implement on its side along the top after the seed is sown. I choose dropping weather, if possible about the middle of April, for sowing the seed; and always mix it with moist sand a few days previous to sowing, first being careful to float it, and skim off such seed as appears small and light. A few drills being drawn, I set two little boys or girls to drop the seed, which is now swollen and beginning to bud, depositing a seed as nearly as possible every six inches; a boy follows with the souflet on its side, and with this number of hands, viz. a man and three boys, I sow an acre a day. I am aware that machines have been invented for sowing the seed, but do not think they can perform as well as the machinery I have described, neither is the plan of dropping the seed in holes formed by the dibber, whether of one or many prongs, nearly so good a plan, for if wet weather follow the sowing, and particularly if the ground

* From the Irish Farmer's and Gardener's Magazine; a very excellent and spirited publication.

be stiff, the hole becomes a reservoir of water, and the plant perishes or assumes an unhealthy appearance. About three pounds of seed is sufficient for an acre.

If the weather is genial, the plants will make their appearance in about eight or ten days; and as more than one plant will generally arise in each place, although but one seed (or rather capsule or seed-vessel, which it really is, each containing one, two, or three seeds) were sown, they must be thinned as soon as they arrive at the height of about two inches, the strongest of course being left with those that are pulled up: any misses that may be observed must be made up. This is the only case in which I recommend transplanting mangold wurtzel, for it is impossible to take it out of the ground without injuring the tap-root, and that once destroyed, the plant becomes forked, and seldom acquires a great size. The plants must be kept clear of weeds, and be alternately filled so as to stand one foot apart.

The drill-harrow, with the lower line on each side bent nearly at a right angle, is the proper implement for keeping the ground clear between the drills; and the garden-hoe will remove the weeds from between the plants. It is usual after the drill-harrow to raise the loosened earth to the plants with the double-mould-board plough; but this practice I consider erroneous. It has been recommended in some of the periodicals lately, not to earth up potatoes; but the growth and nature of the two plants are very dissimilar; the latter throws out runners, and forms tubers in the loosened earth; whereas the object is to get the former to strike downwards. I was led to form this opinion by observing, that the best roots are always those that rise highest out of the ground, and are most exposed to the influence of the air; and I became confirmed in it by the result of experiments, which I instituted for the purpose of ascertaining the comparative value of each mode of treatment.

Any plants which appear to be starting for seed, should be cut down nearly to the point from which the stalk originates, leaving however a few eyes. Should they make a second attempt, which many of them will, I repeat the heading down, and find that I thus force the plant to acquire a tolerable size. Cultivators of this root appear to be divided in opinion as to the propriety of taking off the leaves during the growth of the plant; some affirming that we lose as much or more in the weight of the roots, as we gain by using the leaves. On this subject I was desirous to obtain information; and on observing that the Agricultural Society of Doncaster had published a report on this subject, possessed myself of it; but what was my surprise to find that this important part of the treatment of mangold wurtzel was not even alluded to—the only mention of the leaves being a recommendation to cut them together with the crown off at the time of taking up the roots, and carry them to the cow-house or feeding-yard?—no, but to plough them down for manure. In want, then, of satisfactory information on this point, I adhere to the plan I have so long pursued with such good effect, which is to take off the large flagging leaves which hang down on the ground, of which an acre will supply a great quantity of fodder. I have made experiments for the purpose of ascertaining this point; but hitherto they are not conclusive. I shall repeat them; and may on a future occasion make known through the "Farmer's and Gardener's Magazine." Towards the beginning of November these roots will have attained their full size; and as they are very easily injured by frost, should be secured on being taken up. Some time previous to this I commence cutting off the tops, and carting them to the piggery, byer, and feeding-yard, by which means I never have a greater quantity than I can use whilst fresh; the roots being taken up on a dry windy day, are pitted in a dry situation, or placed in a shed as convenient as possible to the place where they are to be consumed; if in the open air, I place some straw over them, which I cover with earth at least a foot thick; if in a shed, a little hay or straw will be sufficient covering.

ON THE CHANGES PRODUCED IN PLANTS BY CULTIVATION.

BY PROFESSOR LYELL, OF KING'S COLLEGE, LONDON.*

Common wheat was procured by Delille from closed vessels in the sepulchres of the [Egyptian] kings, the grains of which retained not only their form, but even their colour, so effectual has proved the process of embalming with bitumen in a dry and equable climate. No difference could be detected between this wheat and that which now grows in the East and elsewhere, and similar identifications were made in regard to all the other plants.

And here we may observe, that there is an obvious answer to Lamarck's objection, that the botanist cannot point out a place where the common wheat grows wild, unless in places where it may have been derived from neighbouring cultivation. All naturalists are well aware that the geographical distribution of a great number of species is extremely limited, and that it was to be expected that every useful plant should first be cultivated successfully in the country

* From "Principles of Geology."

where it was indigenous, and that, probably, every station which it partially occupied when growing wild, would be selected by the agriculturist as best suited to it when artificially increased. Palestine has been conjectured, by a late writer on the Cerealia, to have been the original habitation of wheat and barley, a supposition which appears confirmed by Hebrew and Egyptian traditions, and by tracing the migrations of the worship of Ceres, as indicative of the migrations of the plant.

If we are to infer that some one of the wild grasses has been transformed into the common wheat, and that some animal of the genus *canis*, still unreclaimed, has been metamorphosed into the dog, merely because we cannot find the domestic dog, or the cultivated wheat, in a state of nature, we may be next called upon to make similar admissions in regard to the camel; for it seems very doubtful whether any trace of this species of quadruped is now wild.

But if agriculture, it will be said, does not supply examples of extraordinary changes of form and organization, the horticulturist can, at least, appeal to facts which may confound the preceding train of reasoning. The crab has been transformed into the apple; the sloe into the plum; flowers have changed their colour and become double; and these new characters can be perpetuated by seed;—a bitter plant, with wavy sea-green leaves, has been taken from the sea-side, where it grew like wild charlock, has been transplanted into the garden, lost its saltness, and has been metamorphosed into two distinct vegetables, as unlike each other as each is to the parent plant—the red cabbage and the cauliflower. These, and a multitude of analogous facts, are undoubtedly among the wonders of nature, and attest more strongly, perhaps, the extent to which species may be modified, than any examples derived from the animal kingdom. But in these cases we find, that we soon reach certain limits, beyond which we are unable to cause the individuals, descending from the same stock, to vary; while, on the other hand, it is easy to shew that these extraordinary varieties could seldom arise, and could never be perpetuated in a wild state for many generations, under any imaginable combination of accidents. They may be regarded as extreme cases brought about by human interference, and not as phenomena which indicate a capability of indefinite modifications in the natural world.

The propagation of a plant by buds or grafts, and by cuttings, is obviously a mode which nature does not employ; and this multiplication, as well as that produced by roots and layers, seems merely to operate as an extension of the life of an individual, and not as a reproduction of the species, as happens by seed. All plants increased by the former means retain precisely the peculiar qualities of the individual, they have only a determinate existence; in some cases longer, and in others shorter. It seems now admitted by horticulturists, that none of our garden varieties of fruit are entitled to be considered strictly permanent, but that they wear out after a time; and we are thus compelled to resort again to seeds; in which case, there is so decided a tendency in the seedlings to revert to the original type, that our utmost skill is sometimes baffled in attempting to recover the desired variety.

The different races of cabbages afford, as we have admitted, an astonishing example of deviation from a common type; but we can scarcely conceive them to have originated, much less to have lasted, for several generations, without the intervention of man. It is only by strong manures that these varieties have been obtained, and in poorer soils they instantly degenerate. If, therefore, we suppose in a state of nature the seed of the wild Brassica oleracea to have been wafted from the sea-side to some spot enriched by the dung of animals, and to have there become a cauliflower, it would soon diffuse its seed to some comparatively steril soils around, and the offspring would relapse to the likeness of the parent stock, like some individuals which may now be seen growing on the cornice of old London bridge.

But if we go so far as to imagine the soil, in the spot first occupied, to be constantly manured by herds of wild animals, so as to continue as rich as that of a garden, still the variety could not be maintained, because we know that each of these races is prone to fecundate, and gardeners are compelled to exert the utmost diligence to prevent cross-breeds. The intermixture of the pollen of varieties growing in the poorer soil around, would soon destroy the peculiar characters of the race which occupied the highly-manured tract; for if these accidents so continually happen, in spite of us, among the culinary varieties, it is easy to see how soon this cause might obliterate every marked singularity in a wild state.

Besides, it is well known that although the pampered races which we rear in our gardens for use or ornament, may often be perpetuated by seed, yet they rarely produce seed in such abundance, or so prolific in quantity, as wild individuals; so that if the care of man were withdrawn, the most fertile variety would always, in the end, prevail over the more steril.

Similar remarks may be applied to the double flowers, which present such strange anomalies to the botanist. The ovarium, in such cases, is frequently abortive, and the seeds, when prolific, are generally much fewer than where the flowers are single.

Some curious experiments recently made on the production of blue instead of red flowers in the Hydrangea hortensis, illustrate the immediate effect of certain soils on the colours of the petals. In garden-mould or compost, the flowers are blue; and the same change is always produced by a particular sort of yellow loam.

Linnæus was of opinion that the primrose, oxlip, cowslip, and polyanthus, were only varieties of the same species. The majority of modern botanists, on the contrary, consider them to be distinct, although some conceived that the oxlip might be a cross between the cowslip and the primrose. Mr. Herbert has lately recorded the following experiment:—"I raised from the natural seed of one umbel of a highly-manured red cowslip, a primrose, a cowslip, oxlips of the usual and other colours, a black polyanthus, a nose-in-nose cowslip, and a natural primrose bearing its flower on a polyanthus stalk. From the seed of that very nose-in-nose cowslip I have since raised a nose-in-nose primrose. I therefore consider all these to be only local varieties upon soil and situation." Professor Henslow, of Cambridge, has since confirmed this experiment of Mr. Herbert, so that we have an example, not only of the remarkable varieties which the florist can obtain from a common stock, but of the distinctness of analogous races found in a wild state.

On what particular ingredient, or quality in the earth, these changes depend, has not yet been ascertained. But gardeners are well aware that particular plants, when placed under the influence of certain circumstances, are changed in various ways according to the species: and then as often as the experiments are repeated, similar results are obtained. The nature of these results, however, depends upon the species, and they are, therefore, part of the specific character; they exhibit the same phenomena again and again, and indicate certain fixed and invariable relations between the physiological peculiarities of the plant, and the influence of certain external agents. They afford no ground for questioning the instability of species, but rather the contrary; they present us with a class of phenomena which, when they are more thoroughly understood, may afford some of the best tests for identifying species, and proving that the attributes originally conferred, endured so long as any issue of the original stock remains upon the earth.

LIST OF GRASSES AND OTHER PLANTS COMMON IN THE PASTURES OF CARNARVON AND ANGLESEY.

BY J. S. MENTEATH, ESQ., CLOSEBURN HALL.*

Veronica officinalis.
——— chamædrys.
——— agrostis.
——— arvensis.
Pinguicula vulgaris.
Anthoxanthum odoratum.
Valeriana locusta.
Eleocharis palustris.
Scirpus cæspitosus.
Eriophorum polystachion.
——— angustifolium.
——— vaginatum.
Nardus stricta.
Phalaris arundinacea.
Alopecurus pratensis.
——— geniculatus.
Agrostis canina.
——— vulgaris.
——— alba.
Aira cæspitosa.
—— flexuosa.
—— præcox.
—— caryophyllea.
Holcus lanatus.
——— mollis.
——— avenaceus.
Melica cærulea.
Poa trivialis.
Poa pratensis.
—— annua.
Triodia decumbens.
Briza media.
Dactylus glomerata.
Cynosurus cristatus.
Festuca ovina.
——— vivipara.
——— duriuscula.
——— bromoides.
——— pratensis.
Bromus mollis.
Avena fatua.
——— pubescens.
——— flavescens.
Lolium perenne.
Triticum repens.
——— caninum.
Scabiosa succisa.
——— arvensis.
Sherardia arvensis.
Galium saxatile.
——— verum.
Plantago major.
——— lanceolata.
——— maritima.
——— coronopus.
Alchemilla arvensis.
——— vulgaris.
Myosotis scorpioides.
Primula vulgaris.
——— veris.
Anagallis arvensis.
Campanula rotundifolia.
Jasione montana.
Viola canina.
——— tricolor.
Chenopodium album.
Hydrocotyle vulgaris.
Bunium flexuosum.
Heracleum Sphondylium.
Chærophyllum sylvestre.
Narthecium ossifragum.
Junci, about 15 species.
Erica vulgaris.
Stellaria media.
——— holostea.
——— graminea.
Fragaria vesca.
——— sterilis.
Tormentilla officinalis.
Caltha palustris.
Ajuga reptans.
Glechoma hederacea.
Betonica officinalis.
Thymus serpyllum.
Prunella vulgaris.
Rhinanthus Crista-Galli.
Euphrasia officinalis.
Radiola palustris.
Cardamine hirsuta.
——— pratensis.
Polygala vulgaris.
Ononis arvensis.
Ulex Europæus.
—— nanus.
Vicia sativa.
Ornithopus perpusillus.
Trifolium repens.
——— pratense.
——— procumbens.
——— minus.
Lotus corniculatus.
Medicago Lupulina.
Leontodon Taraxacum.
Hieraceum Pilosella.
Tussilago Farfara.
Senecio vulgaris.
Bellis perennis.
Achillæa Millefolium.
Carex, about 30 species.

* From a paper communicated by the author, printed in the Wern. Trans.

LIST OF SNOWDON PLANTS.

BY WM. WILSON, OF WARRINGTON, ESQ. AUG. 1828.

PLANTÆ FREQUENTIORES.

Saxifraga nivalis, Wyddva summit, and near Twll Du.
Cerastium latifolium, Clogwyn y Garacold.
Aspidium Lonchitis.
Serratula alpina.
Salix herbacea.
Epipactis argifolia.
Orchis albida, near Llanberris, below Ffyanon Frech.
Juncus triglumis.
Sedum Fosteranium.
Saxifraga oppositifolia.
Juniperus nanus, Glyder Fawr.
Subularia aquatica, Lleyn Ogwen.
Isoëtes lacustris, Ffyanon Frech.
Chara gracilis, Lleyn Idwal.
Alisma natans, between the lakes and Llanberris.

PLANTÆ RARISSIMÆ.

Anthericum seratinum, near Twll Du.
Arabis hispida, Clogwyn Du'r Ardhu.
Saxifraga cæspitosa, near Twll Du.
Woodsia ilvensis, near Llyn y Cwn } Ferns.
W. hyperborea, Clogwyn y Garnedd } Ferns.
Cyathea (now Cistea) regia, Clogwyn Du'r Ardhu.
Lobelia Dortmanna, Llanberris lakes, Lleyn Idwal.
Potentilla alpestris, Clogwyn y Garcold.
Asplenium viride, near Twll Du.
——— septentrionale.
Epilobium alsinifolium, Cwm Gaseg, below Garned Llenllyn, and by Aber Waterfall.
Rubus saxatilis, near Twll Du, also at Fachmere.
Papaver Cambricum, near Llanberris.
Thalictrum minus, Clogwyn Du'r Ardhu, and Twll Du.
——— alpinum, do. and near Twll Du.
Poa alpina, do. and Clogwyn y Garnedd.
—— Glauca, near Twll Du.
Epilobium angustifolium, by Lleyn y Cwm.
Carex rigida, Wyddfa summit.
—— atrata, below Ffynon Frech.
Draba incana, do.
Galium boreale, do. and near Twll Du.
Arenaria verna, do. do.
Rosa villosa, near Llanberris
Hieracium alpinum, near Lleyn y Cwm.

Asplenium septentrionale, Hyperborea, and Hieracium alpinum, are so excessively scarce in Carnarvonshire, indeed almost extinct, that there is little probability of obtaining them: they are more plentiful in Scotland. The first of these is found chiefly on Arthur's Seat.

The following are common on the mountains:—

Rhodiola rosea.
Saxifraga hirta, platypetala.
Silene acaulis.
Gnaphalium dioicum.
Saxifraga stellaris.
Asplenium trichomanes } Ferns.
Cistea fragilis } Ferns.
Polypodium Dryopteris } Ferns.
——— Phegopteris } Ferns.
Trollius Europæus.
Hieracium maculatum, near Twll Du.
Lycopodium alpinum.
——— selaginoides.
——— selago.
Hymenophyllum Tunbridgense.
Vaccinium Vitis-Idæa.

Rubus Chamæmorus is hardly to be found in Carnarvonshire. It is said to be common on the Berwyn mountains, on the peaty bogs near the summits.

ON CLUBROOT.

BY THE EDITOR.

Clubroot is a sort of galls produced by insects on the roots of cabbages, turnips, holyhocks, and other species of cultivated plants, sometimes called anbury, and popularly, but mistakingly, supposed to arise from peculiarities of soil, or growing the same crop successively on the same field, or to variations of seasons. Nothing can be more simple than the disproof of all these theoretical notions: take some of the cabbages or turnips whose roots are infected with anbury, and keep them in garden-pots covered over with close gauze, and in a short time, if the plants be kept growing, the little weevils, evolved from the grubs in the interior of the roots, will make their appearance, ready to multiply their species, by depositing their eggs, as their parents had done, on the first turnip or cabbage they can find; then is the critical time to destroy them, and prevent their increase. The weevil thus arising continues to be no less, often more, destructive than the grub had proved to be in feeding on the roots; for it thrusts its beak (*rostrum*) into the seed-leaf of the turnip, and greatly injures the crop. Neither of these insects would ever be bred in dung. When the turnip is advanced to the rough-leaf, these insects either die, as most insects do when they have laid their eggs, or betake themselves to some other plant, such as clover, suited to their taste.

It will be therefore evident that no peculiar rotation of crops, nor peculiar manure for dressing the soil, can be of any avail in preventing anbury, or in stopping its progress when the insects have obtained a lodgment within the roots. The destruction of the adult insects before they have laid their eggs is the only remedy, though in the case of so small a species it is peculiarly difficult to put in practice.

IMPROVEMENTS IN AGRICULTURE AND GARDEN CULTURE.

BY A CORRESPONDENT.

It has ever been our opinion that if the intelligence of the country was properly brought into operation, that we might so improve the earth's surface as to make England independent of foreign corn. This has been proved by the experiments of Mr. Lance, and the reasonings which he has set forth in his Agricultural Essays. We are satisfied that more than half the present seed-corn might be saved—that labour on the land might be beneficially increased—and the surface in tillage be made to produce one-third or one-half more than it now does. But, then, scientific reason must guide our farmers, and not the rule of thumb alone. In addition to what has gone the round of the public journals, relative to Mr. Lance's great increase of corn produce, by culture and careful seeding, as now exhibiting in London, we are favoured with the following additional proofs of what a saving of corn will do. Mr. Young, at Farnham Wharf, being the barren Bagshot sand district, set some peas at regular distances in properly prepared ground; they tillered out prodigiously, some to three or four stems, and in one instance he counted one hundred and forty pods from one pea, and the produce was seven hundred and seventy peas; these were the Marlborough grey. A new sort of pea has been grown by J. Langdon, Esq., Broomsgrove, Worcestershire, which produced ninety pods: they are exhibiting at the Museum of Arts, Leicester-square. Other persons, who sow in the usual old routine of seeding, get about six-fold for their labour, six times only what they put in the ground. The same Mr. Young above mentioned, has experimented on Mr. Lance's plans; he, unlike other farmers, is not frightened at the word experiment, and does not consider it in the same light as speculation. He has obtained at the rate of eight quarters per acre of wheat, and in one particular experiment he obtained sixty-fold for the seed he put into the ground, on the hitherto despised sandy soil a few miles before you reach Farnham.

REPORT OF A NURSERY OF HALF AN ACRE, AT MUCRUSS, COUNTY KERRY.

BY THE REV. T. RADCLIFF.

1801. Planted sixteen acres of Turk mountain, with 97,000 Scotch fir, oak, ash, and sycamore, and twenty-two pecks of acorns dibbled. Transplanted 98,000 forest trees.

1802. Planted nine acres of Turk mountain, and thirteen acres of Rusneagarry, with 131,000 trees of the above kinds. Transplanted 184,000, amongst them 70,000 larch from Scotland, all the rest reared at home.

1803. Planted sixteen acres in various directions with 104,000 forest trees. Planted in the nursery 131,000 seedlings, principally oak.

1804. Planted sixteen acres in detached pieces with 114,000 forest trees. Planted in nurseries 336,000, 300,000 of which were oak, reared at home.

1805. Planted ten acres with oak, &c. so as to obtain a premium from the Dublin Society. Replaced the wood of Tonris 1500 acres, by 49,000 three year old oak. Planted 5,200 in the nursery.

1806. Repaired the planting of the years 1801, 1802, and 1803; also planted about three acres. Transplanted in nursery 68,000 forest trees.

1807. Repaired the planting of former years, planted small pieces, and planted in the nursery 68,000 forest trees.

1808. Planted ten acres with 70,000 trees, chiefly oaks. Repaired the wood of Caiarnabawn. Planted the fall of the last year, with 16,000 oak of eight years old. Planted in nursery 76,000 forest trees. Sold 50,000 seedlings.

1809. Planted the fall of the last year, with 22,000 oak. Planted in nursery 40,000 seedlings. Sold 30,000 seedlings.

1810. Planted the fall of the last year, with 12,000 oak. Planted in nursery 32,000. Sold 35,000.

1811. Planted the fall of the last year, and a large tract coppiced in, with 40,000 oak and Scotch fir. Planted in nursery 32,000. Sold 35,000.

1812. Headed down all the oaks in the planting of 1808, and planted amongst them 10,000 Scotch fir, as nurses. Finished planting bavina wood, of 4,300 acres. Planted in nursery 30,000. Sold 35,000.

ON COTTAGERS' GARDEN SOCIETIES.

BY JAMES STUART MENTEATH, ESQ.*

Few employments are more useful, or more amusing than gardening; while it ornaments the country with a variety of beautiful plants, it may be made the means of contributing to the comfort and sustenance of numbers, by an abundant supply of vegetables.

It is somewhat extraordinary that in Scotland, a country which supplies England with some of her best gardeners, the labouring population should be so little acquainted with the culture of the garden. We need not be surprised at the disappointment which the English traveller feels, when passing through Scotland, in observing the garden ground attached to the cottage, neglected, ill cultivated, and for the most part overgrown with weeds and useless plants. We can hardly tell, from this neglected state of the cottage garden, how it should come that Scotch gardeners are so frequently found in the employment of the richer classes in England.

To remove all ground for such remarks on Scotch cottage gardening, and to spread among all the labouring people of Scotland an universal taste for this most useful art, the following hints are suggested.

In almost all professions we observe, that the members of them, in order to advance their skill and acquaintance with the art they are pursuing, form themselves into a society. And to stimulate each other in their progress, rewards are fixed and distributed among the most deserving.

Ploughing matches, and horticultural societies, as every one knows, have done much to improve the skill, dexterity, and intelligence of the ploughman, and the gardeners of the landed proprietors.

With this view we propose that a Gardening Society, solely confined to the labourers of one or more parishes of any district, should be formed. That rules and regulations be drawn out for regulating the concerns of such a society. That regular meetings at different periods of the year should be held, at each of which there should be exhibitions of the produce of the gardens of the different members. That prizes should be awarded to the exhibitors of the best fruits, herbs, roots, and vegetables, and perhaps of the more ordinary kinds of flowers. That a list of the competitors for the prizes should be published sometime before the meetings of the society: and, to afford general satisfaction, that the choice of the judges should be left to the competitors. That bee husbandry be encouraged, by rewarding those who raise the greatest quantity of honey. That prizes of the following articles be distributed—money, packets of seeds, each packet containing an assortment of all the useful kitchen garden seeds, with a few flower seeds, garden tools, and a few useful short works on common kitchen gardening. That the smallest annual subscription from each member be received. That an account of each of the meetings be drawn out, with the list of the names of the successful parties, and be inserted in one of the county newspapers.

That the society should annually purchase a quantity of the best kitchen garden vegetable seed, and re-sell it at a reduced rate to its members, in such proportions as each of their small gardens require.

That landed proprietors in the neighbourhood should be solicited to aid the usefulness of the society, by sending for distribution among its members, hardy evergreens, cuttings, and seeds of useful and ornamental plants; and in order particularly to encourage the children of the members of the society in the same taste, that prizes should be given to such children as have produced, at the meetings, flowers cultivated by their own hands in their little gardens.

The advantages of such a Cottage Garden Society must be so apparent to all as scarcely to demand enumeration.

Among the chief advantages would be that of fostering a general spirit of gardening throughout the district. By giving prizes at the several meetings within the year, deserving and meritorious members' exertions would be publicly made known, and their praiseworthy industry be rewarded in the presence of their fellows.

Many of the members—as several of the prizes would consist of packets of seeds, consisting of most of the most useful common kitchen vegetables, would have at command, for sowing their gardens, the proper seed; and those who are not successful in obtaining prizes, might, at a reduced price, purchase from the society such vegetable seeds as they wanted.

The society, also, having at its disposal, by the liberality of the landed proprietors in the neighbourhood, presenting them for distribution, hardy evergreens, cuttings, and seeds of useful plants, would give these away among its members.

Last, not least, of the benefits of such a society, would be the ample increased supply of wholesome garden vegetables, for the use of the cottager's family, of his pig, and of his cow. And in addition to

* Circular communicated by the author.

this, by the increasing interest the labourer would take in cultivating his garden, his health and comfort would be vastly augmented.

The skill and intelligence of all being thus promoted, the best method of raising the greatest possible quantity of garden produce on a given piece of ground would be discovered. Many useful and valuable vegetables, unknown and uncultivated in a parish, would be introduced. Such a society would also be a little seminary, where many an intelligent young man, learning the rudiments of gardening, would be qualifying himself to manage the garden of a nurseryman or of some landed proprietor.

The landed proprietor, while witnessing the increased zeal and laborious efforts of the cottagers to cultivate their gardens, to obtain the prizes offered at the different exhibitions, could not fail to view them with the liveliest interest. His support and kindness to them would be rewarded on their part by the most grateful feelings; and thus the links of society, now too far apart, would be drawn closer and closer.

In short, the success of such a parish Garden Society as is just pointed out, would be a triumph of knowledge over ignorance; of virtue over vice; of happiness over misery. And instead of the cottager indulging himself in sloth and drunkenness, we should see his leisure hours spent in his garden: his pleasure would be in the society of his wife and children; and his anxiety be, that they should share with him in all the domestic comforts that could be afforded by his garden.

To shew more fully than any reasoning can do, the good effects of such an institution, it may be mentioned that a society, nearly of the same kind, has existed for several years in the Glenkens of Galloway, formed, we believe, under the direction of Mr. Grierson, of Garroch. The effects in that quarter have already been remarkable, in improving the appearance and comfort of the cottages, and in bettering the habits of the labouring classes.

Were these Garden Societies once established in separate parishes, a number of them might be united in one district, into a larger Garden Society, as has been done in that of the Glenkens Society, to which allusion has already been made, and prizes of a larger amount to be distributed among the successful competitors belonging to it.

Closeburn Hall, Dumfries-shire.

ON THE CULTURE OF HYACINTHS.

BY E. ESBURY.*

I SEND you an abbreviation of a paper on this subject, by the Honourable and Reverend William Herbert, which contains an account of the Dutch method of management, and as the author is known to be a skilful cultivator of bulbous-rooted plants, may be considered fully sufficient for the successful cultivation of these beautiful flowers in England.

The compost used at Haarlem (the centre of hyacinths in Holland), is rotten cow-dung, rotten leaves, and fine sea sand. In making this compost, the Dutch gardeners prefer the leaves of elm, lime, and birch, on account of their rotting more quickly than those of other trees. The cow-dung which they use is also of a peculiar quality, being collected without any mixture of straw or other litter, in the winter, when the cattle are fed upon dry food. The cow-dung and leaves must not be used till they are thoroughly decayed; the compost should then be mixed in the following proportions, viz. one-sixth rotten leaves, two-sixths pure sand, and three-sixths rotten cow-dung; and it should be allowed to be together some time, to ameliorate and incorporate, before it is used for the beds. This compost retains its qualities about six or seven years, but the Dutch avoid setting hyacinths in it two years successively; nor do they set them in it the first season, as the fresh manure might be injurious to them. In the alternate years they plant tulips, narcissi, &c. The beds should be made about three feet in depth with the compost, and must not be trodden down hard, but, trenches being opened, the bulbs may be arranged, and then carefully covered, from three to five inches deep. They should not be dibbled or pressed into the compost. A little pures and placed round the bottoms of young bulbs is believed to prevent them from cankering. The later sorts nearest the surface, to make them flower earlier. If the situation is wet in winter, the beds may be raised six inches, or even more, above the level of the soil, to prevent the injury which the bulbs might receive from moisture; but if too much elevated they will suffer from drought. The Dutch cover their beds with dung in winter, to keep off the frost, but this appears unnecessary in our climate. When the leaves of hyacinths begin to wither, the bulbs should, if possible, be pulled out of the bed by the hand, to avoid the danger of cutting them with a spade; the leaves should be cut off, and each bulb laid on its

* From Hort. Register.

side, covering it lightly with the compost about two inches thick;—in this state they should be left about a month (but the tardy sorts are usually left longer, and more lightly covered), and then taken up in dry weather, and exposed to the open air for some hours, but not to a powerful sun, which would be very injurious to them. They should after this be carefully examined, and the decayed parts of any bulbs which may have cankered, must be removed with a knife; for which purpose it will sometimes be necessary to cut deep, for if it is not done effectually, the whole bulb becomes diseased, and infects others which may be near it. The bulbs should be placed in an airy store-room about the end of June; they must not be suffered to touch each other, and must be frequently looked over, in order to remove those which may shew fresh symptoms of decay, until November, the time for replanting. Old tan, well decayed and pulverized, may be substituted in the compost above described if leaves cannot be obtained; and when the compost has been in use for about six years, it will be necessary to renovate it by the addition of some fresh materials.

DESCRIPTION OF A GARDEN.

BY MATTHÆUS SYLVATICUS.

Phœnicia's gardens have enough been sung,
Enough the praise of proud Versailles has rung;
Where stiff in rows the walks and groups are made,
And Nature's corpse at Euclid's feet is laid.
Rise, rustic Muse, and sing, in simple strain
————'s little garden, small in vain;
Where Art in Nature's wildest pathway treads,
And boldly follows wheresoe'er she leads;
Where rivers flow, where rocks stupendous rise,
And where th' expanded lake reflects the skies.

First, from the house o'er level walks we pass,
With flowers bordered, and with verdant grass;
Here roses and diosmas freely grow,
Here heaths and beauteous myrtles deign to blow;
Here clove carnations catch the dazzled sight,
And helianthus pours a blaze of light.

A rural trelliage gate we now pass through,
Shaded and arched o'erhead by lilac blue:
The sumach with the dahlia here combines,
And coreopsis, bright in beauty, joins.
Thence to the left we turn, ascending high
A rising hill salutes the gazing eye;
Far on the right extends a verdant mead;
Rocks on the other side to rocks succeed;
Pomona's offerings overhang the road,
Scarce can the branches bear the luscious load;
Geraniums smile beneath the solar ray,
And antirrhinum courts the eye of day:
Thine arms, convolvulus, each tree embrace,
And gentianella beautifies the place.
But soft—behold where yonder mountain's brow
With lordly scorn surveys the vale below;
A nodding wood adorns its topmost height,
O'ergrown with shrubs impervious to the sight;
And, where a torrent once its passage rent,
A rough and dark defile affords descent:
So in Breadalbane's wilds, 'mid forests green,
The Trosach's glen contrasts the sylvan scene.

The mountain pass'd, to strike our wondering eyes
The lake's unnumber'd beauties next arise;
So clear the flood we see the spreading sands,
The garden in the crystal mirror stands;
While China's glittering fish, securely gay,
At ease within its bosom bask or play.

A length of pleasant walk we now must tread,
To reach a bridge across a river spread;
Here, pleased to rest, a rustic bower we view,
Where our exhausted strength we can renew.
Such varied charms this lovely seat can boast,
We know not which to like or praise the most.
Within, all neatness, Flora for her own
Has fix'd this spot, and here has placed her throne;
Without, th' acacia waves her graceful head,
The glowing cistus all around is spread;
The holyoak its varied beauty shews,
And ivy gives the scene its due repose.

Recruited now, we leave the sylvan seat,
And view the precincts of the sweet retreat;
Far on the left, old Bacchus' plant appears,
Each lengthen'd branch the luscious fruitage bears;
No trees are near, and here, in pomp display'd,
Are all those flowerets which avoid the shade.

Another bridge we cross, again the lake
Displays its charms, the woodland view to break:
Unnumber'd sweets, around its borders shewn,
Our every sense delight and make their own.
A grateful coolness tempers here the heat,
A mulberry grove affords a calm retreat.

Border'd with grass the winding path proceeds,
Thro' numerous groups of flowers it homeward leads;
Again the flower garden paths we tread,
And to the house by Friendship's hand are led.

DESCRIPTION OF THE PLATES.

POINCIANA PULCHERRIMA.

Decandria Monogynia, Linnæus; Cassieæ, De Cond.

Calyx 5-phyllus, inferiore majora. Petala 5, summum difforme. Stam. longissima; omnia fœcunda, discreta. Legumen compressoplanum, bivalve, pluriloculare. Sem. unicum in singulis loculamentis.

Poinciana pulcherrima; aculeis geminis. *Spec. Pl.* 554. *Reich.* 2. *p.* 258. *Hort. Ups.* 101. *Hort. Kew.* 2. *p.* 54. *Jacq. Amer.* 122. *Ld. Pict.* 62. *t.* 120

Poinciana. *Tourn. Just.* 619. *t.* 391. *Brown Jour.* 225. *Hughes Barbad. p.* 201.

Cæsalpinia pulcherrima; foliolis oblongo-ovalibus emarginatis calycibusque glabris, corymbes simplicibus petalis imbriatis, staminibus longissimus. *Swartz. Obs.* 166. *Willd. Sp. Pl.* 2. 531. *Mart. Mill. Dict. a* 2

Senna spuria arborea spinosa, &c. *Sloane Jan.* 2. *p* 49.

Crista Pavonis flore elegantissimo variegato. *Burn. Zeyl* 79.

Crista Pavonis frutex pavonius. *Breyn. Ceut.* 61. *t.* 22. *Raii Hist.* 981.

Acacia orientalis gloriosa, coluteæ foliis, ad genicula spinis gemellis aculeata. *Pluk. Alur.* 5.

Flos Pavonis *Mer Sur.* 45. *t.* 49.

Tsietti mandaru. *Rheede Mal.* 6. *p.* 1. *t.* 1.

The name of Poinciana was given to this splendid shrub by Tournefort, in commemoration of M. de Poinci, governor of the Antilles. Its English appellation denotes the use to which it is frequently applied in the West Indies, and Jacquin remarks that a hedge made of this plant, especially when mixed with Parkinsonia aculeata, forms the most beautiful fence imaginable; indeed few flowers have been described in more enraptured language. Although long since widely diffused through the West India isles, and frequently found of spontaneous growth, it is doubtful whether it be originally indigenous there. Ligon says expressly that it was imported into Barbadoes from the Cape de Verd Islands. It is cultivated through all the tropical countries of the East, especially wherever any Chinese are settled, by whom it is called the Peacock's breast. It was introduced into Holland from Amboyna about the year 1670, and cultivated in Chelsea Garden, by Sir Hans Sloane, in 1691; but as it cannot be preserved out of the stove, nor propagated except by seeds, it must ever remain a rarity in northern climes.

The flowers are said to be sweet-scented; but the whole plant, when bruised, diffuses a disagreeable smell, very like that of Savin, which it appears to resemble in virtue, being considered, in the West Indies, as a powerful emmenagogue.

Swartz has thought proper to unite Poinciana with Cæsalpinia, in which he has been followed by Willdenow and Martyn; but, that, according to Gærtner, the seed-pod of Cæsalpinia Sapan is one-celled, which in our plant is divided by a transverse septum between each seed; and in respect to the form of the flower, Poincinia seems to have a nearer resemblance to Parkinsonia.

PELARGONIUM PULCHELLUM.

Monadelphia Heptandria, Linnæus; Geraniæ, Jussieu.

Sect. 11. Fructus rostro spirali intus barbato.

Acantia: radice rassiformi: filamentes 5 sterilibus. P. foliis pinnatifidis, laciniis 3-5-lobis: pedicellis brevissimis: calycibus ventricosulis, viscidulo-pubescentibus: petalis spatulatis, inferioribus angustis. Sponte nascentem in Promontorio Cap.

The tuberous-rooted Pelargoniums from the Cape of Good Hope, are so numerous and distinct in their habit, that it is greatly to be wished some character could be found to separate them as a genus. In every flower of the specimen of that now figured which was examined, the anthers were persistent, not falling off soon after shedding their pollen, as in most other Pelargoniums: but whether this circumstance is peculiar to the whole group, or even constant in this one species, has not been ascertained. It seems allied to Mr. Kennedy's *Roseum*, well figured in the Botanical Repository; and the calyx being constantly swelled at the base, may perhaps distinguish it from that and some others.

PHYLLODOCE TAXIFOLIA.

Decandria Monogynia, Linnæus; Ericæ, Jussieu.

Calyx profunde 5-fidus. Corolla 1-petala, decidua. Filamenta 10, toro inserta. Antheræ juxta apicem foramine obovato dehiscentes. Pericarpium superum 5-loculare; septis emarginibus valvarum, ab axi dehiscentibus. Semina elliptica scrobiculata. Fruticulus semper virens, Folia alterna, lateribus reduplicatis quasi subtus sulcata ut in Ericâ. Flores ex axillis 2-9 ultimis fasciculum mentientes, ramo nunc prolifero. Bracteæ 2 ad basin pedunculi præterfolium, persistentes. Nomen poeticum, exemplo immortalis Linnæus in Andromedâ ad hoc genus selagi, quod toto anno etiam subnive foliis ornatur. Illi valde affinis est Erica Daboecii Sp. Pl. quam ob dehiscentiam fructusolim ad Menziesiam retuli uti nuper Jussieu, sed cum inflorescentiâ longe diversâ folio tantum absque bracteis pedunculo subjecta nec non receptaculo seminum abludat, potius erit sui generis.

P. foliorum laminis linearibus, obtusis: corollæ tubo urceolari. Erica cærulea. *Willd. Sp. Pl. v.* 2 *p.* 303.

Andromeda taxifolia. *Pall. Fl. Ross. part* 2. *p.* 54. *t.* 72. *f.* 2.

Andromeda cærulea. *Fl. Dan. t* 57.

Erica foliis acerosis de *Gmel. Fl. Sib. v.* 4. *p* 131. *t.* 57. *f.* 2.

Andromeda cærulea *Linn. Sp. Pl. ed* 2. *p.* 563.

Erica rarior Norwegica. *Linn. Amœn v.* 1. *ed Lugœ. Bat. p.* 332.

Andromeda foliis de *Linn. Fl. Lapp. n.* 164. *t.* 1. *f.* 5.

Sponte nascentem in Lapland abunde, legit C. Linne: in Labrador collibus sicus, legit J. Banks, Baronettus: in Kamschatka et America Borealis oris occidentalibus lat. 52. rupibus muscosis, legit G. W. Steller.

The stems occasionally attain a foot in height when growing among rocks and mossy banks. The leaves are shining green, with a whitish line running through the middle of their under surface, obtuse, line-like, fringed with short gland-bearing hairs at the bend, which is not the true margin, as is sometimes supposed. Flowers on solitary long flower-stalks, issuing from two to nine of the uppermost axils of the leaves. Flower-scales two, at the base of each

flower-stalk, besides the leaf which supplies the place of a third flower-scale; and becomes gradually a little shorter and more like a flower-stalk in specimens with many flowers, all persistent, and not caducous, as in Menziesia. The calyx is finely haired and viscid; the corolla purple, varying to pale red and white, but never blue, for which reason Professor Pallas has very justly changed the name of *cærulea* to *taxifolium*. The anthers are long, without nerves, and obtuse at the base.

DIAPENSIA OBTUSIFOLIA.

Pentandria Monogynia, Linnæus; Ericæ, Jussieu.

Calyx 5-phyllus, peristens. Corolla 1-petala: Tubus calathiformis: Limbus recurvulus, 5-partitus: decidua. Filamenta 5, lata, tubam inter lacinias terminantia. Antheræ didymæ, nunc basi rostratæ. Pericarpium fere totum superum, ovatum, 3-loculare 3-valve, medio loculorum dehiscens. Stylus crassus. Stigma 3-lobam. Semina numerosa, colo retuso ad angulum internum sessilia, subovata. Fruticuli cæpitosi, sempervirentes, Calcilis, foliis, emarcidis vestitus. Folia alterna subopposita, in resus conferta. Flores albi, pedunculo subnullo vel longiusculo 1-rii terminales, erecti. Bracteæ 3 juxta calycem, præter unam alteramne infra sparsas. Genus in serie naturali forsan juxta Azaleum locandam cujus duæ species innotuerunt.

D. obtusifolia foliis spatulatis, glabris: antheris, obliquis, muticis.
D. lapponica. *Oed. in Fl. Dan. t.* 47. *bona.*
D. lapponica. *Linn. Fl. Lapp. n.* 88. *t.* 1. *f.* 1. Sponte nascentem in Lapland, alpibus muscovestitis, legit. C. Linne: in Norway, horridis scopulis, legit. G. C. Oeder: in Ins. Newfoundland, rupibus maritimis, legit. J. Banks, Baronettus: in New Hampshire, alpibus, legit. J. D. Peck: in Kamschatka, legit. J. Dixon.

D. cuncifolia foliis lanceolato-cuneatis, inferne pubescentibus: antheris horizontalibus, basi rostratis. Pyxidanthera barbulati. *Michaux. Fl. Boreali-Am. v.* 1. *p.* 152. *t.* 17. Sponte nascentem in North Carolina, montibus, legit. A. Michaux.

Stems several, leafy, branching closely into little tufts or cushions, which Professor Peck says often become large and firm enough in the White mountains of New Hampshire to bear the weight of a man standing upon them. They are very slender, but woody, and covered with the decayed leaves for years. Leaves dark green, and more or less tinged with brown on their upper surface, yellowish green on their under surface, from four to seven lines long, very closely imbricated, and sitting; their lower part erect, dilated into a thin membranaceous margin, and hollow; from thence recurved, spatulate, very entire, blunt, quite smooth, slightly channelled with convex sides, flattish underneath, thick, and hard. Flowers solitary, and without smell. Flower-stalks terminating most of the principal branches, from six to ten lines long, nearly erect, cylindrical, smooth. Flower-scales three, imbricated near the calyx, erect, oval, persistent: besides these, one or two smaller are scattered lower down; and they are all similar to the leaves in consistence. Calyx of five leaflets: these are somewhat imbricated, erect, oval, often slightly crenulated towards the top, which is rather tumid, quite smooth, nearly equal in size, persistent. Corolla white, full three lines in length: tube bowl-shaped: limb slightly recurved, divided to the base into five egg-oblong, very entire, blunt, flattish divisions: smooth on both surfaces, deciduous. Filaments five, white, terminating the tube between the divisions of the limb, broad, short, erect, somewhat narrower towards the top, quite smooth, hollowish. Anthers yellow, confluent with the filaments, retuse, didymous: lobes oblique, elliptical, 1-locular, 2-valved, splitting lengthwise, not much contracted after the pollen is discharged. Pollen yellow. Seed-vessel green while young, hollow within the surrounding torus, upon which the calyx and corolla are inserted so as not to be quite superior, almost globular, 3-celled: when fully grown, oval, splitting in the middle of the cells. The receptacles of the seeds are retuse. Style pale yellow, reaching to about the height of the anthers, columnar, round, smooth. Summit deep, somewhat egg-shaped, very finely scrobiculated.

This curious little shrub is from Labrador: in that dreary country, as well as others near the Arctic circle, it grows plentifully upon the most barren maritime rocks, insinuating its slender roots into crevices, where there is a little soil.

VACCINIUM BUXIFOLIUM.

Octandria Monogynia, Linnæus; Ericæ, Jussieu.

Pericarpium inferum 4-5-loculare succulentum, clausum, deciduum. Semina. 10-30 in singulis loculis. Corolla monopetala limbo luevi, 4-5-fido; decidua. Antheræ 8-10, valvis apice oblique foraminosis. Frutices quidam humillimi, gemmiferi. Folia alterna, in plerisque dentata, autumno decidua, vel sempervirentia. Flores solitarii fasciculati spicative, sæpius axillaries.
Folia sempervirentia.

V. foliis obovatis, dentatis, glabris, subtus æquatis: spicis e superioribus axillis, dense multifloris: stigmatibus hemisphæricis.
V. brachycerum. *Michaux Fl. Boreali-Amer. v.* 1. *p.* 254. Sponte nascentem circa Winchester in Virginia, legit A. Michaux.

The stems creep a little under the ground, and are covered with a short rough down. Leaves sometimes oval, without any callous dots on the under surface: midrib hairy on its upper surface. Flowers bluish coloured. Common flower-stalk very short. Calyx and corolla generally five-cleft. Filaments ten, attached at the very base to the corolla, but inserted like it, in the receptacle which surrounds the top of the fruit, having anthers shorter than in many others, and without a spur.

A beautiful dwarf species, resembling V. Vitis Idæa, from which however it may always be distinguished by the knobbed summit.

It thrives best in light sandy vegetable mould, among rock, and other shrubs.

1 Trypethelium Sprengelii, Ach.

2. Phlomis Ivchuitis

3. Iris Iwnda

4. Aloe lingua Var. A.

Bignonia venusta.

ON THE CULTURE OF THE PRICKLY COMFREY.*

BY J. T.

In the autumn of 1830, I was induced by the recommendation of a neighbour, and the highly laudatory accounts in some of the public prints, to purchase fifty plants of the Symphytum asperrimum. I received them in November; they were very small, somewhat resembling young primrose plants. They were immediately placed in a bed of rather strong, but sandy loam, abounding with chalky particles, three feet asunder, in rows four feet apart. In spring I perceived that several had perished, in consequence of a large quantity of snow that had accumulated, and lain about that particular piece of ground for a considerable time. The lost plants were replaced by others, procured in the beginning of April, 1831. In common with many other herbaceous plants, the symphytum will remove with the greatest safety and success, just at that period, when, after the recession of the winter frosts, the ground is in a meliorated and readily pulverable state, and the herb in an excitable state, and just beginning to push. If transplanted in the autumn, when dormant and unexcitable, the accumulated prepared juices, that are deposited by the leaves before their final decay, frequently become decomposed by frosts, damp, and particularly by a mass of snow, and decay takes place. This seldom, however, occurs when the plant has remained undisturbed; because the vessels are not lacerated, and, therefore, the connection between the root, or hybernaculum, and the soil continues uninterrupted. My plants, from the period referred to, grew rapidly, and spread extensively; they fully occupied the space allotted to them, and notwithstanding the memorable and extensively destructive frost of the 7th of May, I could not perceive that a leaf was injured.

I had occasion to remove nearly the whole of my plants, and at the latter end of February, 1832, transferred them to a broad border of an orchard with a north-east aspect.

The greater part of the roots were found to be from ten inches to a foot and a half long, readily divisible; they were very succulent, mucilaginous and tender; their internal substance was of a dirty white, but the cuticle of a dark brown colour. These plants stocked the border, the length of which is twenty-six yards, and the breadth about six yards. They were in number, about one hundred and fifteen, and were set in holes, distant three feet by four from each other; and by the end of the month of June, the leaves met, and covered the surface.

After these general facts, I proceed more particularly to notice the soil in which it grows. Mr. Grant, in his circular, says, "It will grow in all soils and situations, superior to any other plant; it may be planted by the sides of ditches, in any waste corner of fields, orchards, gardens, &c. where useless rubbish grows." I have tried my plants in every species of soil I possess, from that of the unprepared, untilled land of a field, where the roots of an adjoining plantation of elms had taken undisturbed possession for years, to the richest manured plot of a kitchen garden. The spot where the bulk now stands, was a soil degraded by rubbish of every kind; it was artificial, and a set of sheds and out offices of a farm yard had been erected on it; brick-bats, lumps of chalk, fragments of glass-bottles abounded; and what with these, and the roots of elm trees, the work of trenching was effected with much labour and difficulty. If the plants have thriven better in one soil than in another, it is perhaps in a sort of stiff but pale sandy loam, which, by analysis, I have found to contain in two-hundred parts, when dry, one hundred and fifty parts of silicious sand, of chalk, fifteen parts, aluminous impalpable matter, twelve parts, oxide of iron, six parts, and of vegetable fibre or water, not separated by the previous process of drying, the remaining seventeen parts.

In regard to their propagation, the plants may be raised from seeds, subject to the difficulty already alluded to; but they may be multiplied to any extent by separation of the roots. These may be torn asunder, chopped lengthways with a spade, or more cautiously divided by the knife or bill-hook, during any period of the growing season; but decidedly by preference just before the central shoot has pushed above ground. They succeed under all these modes of separation, and make fine large plants in a few months. Upon this subject, however, in the very early progress of my experience, I wrote to Mr. Grant, and received a reply of date May, 1831, wherein he stated, that the roots "may be planted at any time when you may wish to increase your stock, care being taken to have a part of the crown with each cutting. It increases freely. I made it from two plants to forty thousand in five years."

The very young plants make rather slow advances

* From the Quart. Journ. of Agriculture.

after removal in the spring, for a month; but if rains fall, and genial temperature supervenes toward the middle of May, they set off rapidly, and extend in every direction; the flower stem is soon developed, and will be perfected in July. But plants made by separation of the larger plants, I have found to grow and expand with amazing rapidity; they resemble in this respect the gigantic rhubarb, (Rheum hybridum, var.) which I have always observed to be accelerated by removal in spring.

"I went down to Lewisham last week," says Mr. W. W. Farnes, in the Farmer's Journal of 14th June, 1830, on the growth of the symphytum," and can assure you I was very much pleased, I may say astonished, at the produce; it was beautifully in bloom, and some of it near seven feet high.

"All that Grant has said of the produce and quality seems to be correct; from the taste of it, I think there can be no doubt but it contains a great deal of nutritious matter. I saw one plant which, I was informed, had been planted three years, containing thirty-two stalks, none of them less than six feet high, and from one and a half, to four inches in circumference. The plant was cut and weighed this day in the presence of Mr. W. C. Selby, of the Bridge-house Farm, Lewisham, and weighed fifty-six pounds."

I never saw the flower stems of my plants above five feet high, but then, till the present season, none of them have been at rest; they have not been in undisturbed possession of the soil, and have been cut over so repeatedly, as to prevent the roots deriving all the vigour and energy which would have been afforded by the foliage, had the stalks been suffered to grow uncut or unpulled during one entire summer.

The experiments that have come under my notice have been made in latitudes coinciding with that of London; but I have observed no difference in the strength and verdure of the leaves, be the aspect what it might. A large part of my stock of plants is shaded by a south-west fence; and although hoar-frost and general cold temperature have prevailed throughout March, and the three first weeks of April, I have already drawn off the leaves in succession, from above one half of the plants; and so rapid is the growth, that by the time the whole shall have been pulled, the operation may be recommenced. A bushel basket nearly of the leaves is collected daily, and given to a cow; and this in a season when the grass in the same orchard is just assuming a full green tint, and beginning to lengthen; and on an adjoining patch of last year's lucerne, is only protruding its first shoots above the surface of the soil.

Mr. Grant observes that he once "cut and weighed one square rod; the average was seventeen tons, three hundred per acre." He says it rises to more than seven feet in height, and so thickly, as completely to cover the ground on which it stands; that by the first of April, (1830,) "it is now fit for cutting." I have not as yet observed it to attain so great a height, but I have often taken a cutting from the crown, placed it in the border or shrubbery, and have seen the herb spread during the same summer to the breadth of nine or ten inches, the flower stem to rise to the height of four or five feet, and the root to penetrate the ground far beyond the depth of a spade, and to an extent that would have furnished three or more fine large plants. Mr. Grant represents the leaves to be eagerly eaten by horses, and this I, as well as a highly respectable neighbour, have proved to be the fact. "Cows do not take it in the first instance so freely as the horse, but they all soon take to it, and then they are quite as eager for it." The fact is, if they are offered to a cow when the flower stem is grown up, the whole stalk and its foliage are so very prickly and rough, that the animal seems to shun it. During the summer of 1832, I greatly feared that the attempt to feed cows with symphytum would end in complete failure. In that season we invariably cut it over with a reaping hook; the leaves were frequently eaten, but the stems were left. The present year, however, I determined should witness another mode of procedure, and as soon as the first leaves were fully expanded, I directed them to be drawn up, and not cut off, and every leaf is now greedily devoured. Dr. Withering says of the common comfrey (Symphytum officinale), cows and sheep eat it; horses, goats, and swine refuse it. The roots are glutinous and mucilaginous." The roots of the S. asperrimum are the same, and I find that cows will eat them freely. The plant also will etiolate, or blanch to perfection, as I discovered by finding one in a bed of damp leaves; it was eight inches high, and as white and crisp as a plant of celery. "Sheep and lambs will take it freely. Lambs will all feed on it before they are a month old, and as it is such a very early plant, it will immediately follow the turnips." I cannot from my own experience determine the correctness of this observation. Mr. Grant finally observes, it is very useful to pigs; that he "kept a sow with twelve pigs chiefly on it; she brought them up well; they all fed on it before they were three weeks old."

Geese do well with it, the young ones will feed on it as soon as hatched; I have invariably found that pigs will eat the symphytum leaves freely, and the stalks also to a considerable extent; but as to geese, my experience by no means justifies Mr. Grant's assertion. I have left leaves all night about the farm yard, when the geese could get at no other food, and could never perceive that one had disappeared. The goslings also refused them at

any age, even when chopped up. I had, however, the experiment repeated yesterday, that I might, before closing this paper, either confirm my past observations, or obtain an exception in favour of those of Mr. Grant, and the result is doubtful. The goslings, it is true, had grass at command, and some young sprouting clover. They would not eat the cut leaves at the time, but they have disappeared during the night. I conclude, therefore, that where grass is of ready access, the geese greatly prefer it. Upon the whole, then considering the precocity of the crop, the plant fairly rising early in April, if the weather be at all genial, and extending with great rapidity; the frequent recurrence of the gatherings; the great abundance of green food yielded, and that for a period of seven months; the quality of that fodder, which appears to be nutritive, and of a mild bland flavour; I arrive at the conclusion that Symphytum asperrimum ought to be considered a valuable adjunct to the byre and farm yard; that it ought to be tried by every impartial experimenter without hesitation, and if the success be equal to what has attended my trial, I have little hesitation in believing, that a piece of comparatively useless ground may be profitably set apart for the culture of so productive a vegetable.

As a caution, and in order to secure the permanency of the plantation, I would enforce the practice of pulling up the leaves, instead of cutting the whole plant over. Grant observes, that he "cannot pretend to say what effect continual cutting may have on a plant, or on the land for many years together; but that he had never known one to die; though some have stood more than twenty years, and in as full vigour as the first." It may be pulled three or four times at the least, that is the full grown leaves may be taken from around the stems; the stems as they advance to a foot high may be broken off to within three inches of the soil, and thus the plant may be always kept down by deforming or mangling it, and some foliage will at all times remain to be acted upon and stimulated by solar light.

With respect to tillage, I should recommend that, after the final gathering, the spaces between the plants (which should be at the least three feet,) be roughly dug or ploughed, and left neat for the winter; that during the first dry and favourable interval, about the middle or close of February, another deep moving of the soil be given, and a little of the mould brought round the plants; and that during the growing season, the ground be kept clean and neat as time will permit. If at any time the surface become hard-bound by treading over, great benefit will be derived from a second stirring of the soil, but that not to such extent as to injure the roots. Manuring may, in some soils, be of use, but I have not observed that it has produced any great advantage; my plants appearing to be as strong on those spots where none has been applied, as on others where a dunghill had previously stood. I hope the foregoing remarks will stimulate many liberal minded cultivators to introduce this plant. It is not required to substitute it for grass or other well tried staple produce; but as of late it has been the earnest endeavours of the philosophic writers of the day, to bring into notice any productive vegetable that may advance the comforts of domestic economy, particularly in the homesteads of those who possess but a small portion of land, and very limited means of support, it surely is desirable that Symphytum asperrimum should be permitted to take its chance with hemerocalis, cichorium, Italian rye grass, or gama grass. The wise man economises in every thing, and though it is to be lamented that the price of the first parcel of symphytum must be considerable, (that is, presuming it is still rated at 20s. per hundred plants,) yet fifty of these would, as I have found, suffice to stock a large piece of ground in little more than six months. I believe that, by suffering one or two plants to ripen, and detach the seeds, and by a careful attention to the young seedlings, in connection with a proper division of the roots in the second of March, after planting, an acre of ground might be sufficiently cropped with this prolific herb.

ON FARM ORCHARDS.

BY MR. MAIN OF CHELSEA.*

It is expedient that every farm should have some portion of orchard ground attached to it. Every landlord should encourage and assist his tenants to plant them, where there is yet nothing of the kind. It is an improvement which bestows benefits on both landlord and tenant. To those who may have such improvement in contemplation, the following observations may be of service.

The most convenient and guarded place for a farm orchard, is immediately behind the house, so

* From the Quart. Journ. of Agriculture.

that the back kitchen door may open into it. It matters not whether it be on the north or any other side of the buildings. Many think that an orchard should be in a low sheltered spot, but this is a serious mistake. Fruit trees do best on a moderately high and open situation. Shelter from wind is certainly necessary, but this protection must be obtained, otherwise than by planting in a dell.

A deep mellow loam is most suitable for an orchard. It does not require to be richly manured, provided it is fresh, unexhausted, and sufficiently dry. Whether the sub-soil be gravel or stone, so as such beds lie not too near the surface, it will be no detriment to the trees; but if of a tenacious clay, which is retentive of moisture, then draining must be resorted to, to free the soil from superfluous moisture. This must be done effectually, otherwise the defect will ever after be regretted by the planter. A sloping surface is better for all plants, than a dead level; not because a heavy or long-continued rain, or melted snow runs the sooner off such a position, but because that portion of it which sinks into the ground gradually passes downward in an under current, leaving no portion of it to stagnate in any one place, so as to be prejudicial to the roots.

There are different kinds of orchards, most generally of apples, as being on the whole, the most valuable of British fruits. Sometimes there is a mixture of pears, rarely all of pears, except in those places where perry is the common drink of the farmer and his labourers. Sometimes we meet with orchards of heart cherries only, which, when near towns, pay well. In some counties there are extensive orchards of Kentish cherries, the soil being a light, sandy, and dry loam, particularly suitable to this variety of fruit. In other places we find the common black or caroun kinds preferred to all others, as being not only richer in quality, but the most certain bearers, and consequently most profitable to the farmer; considerable quantities of them (or their juice) being annually exported to Spain and Portugal, for the purpose, it is said, of colouring wine. This sort of cherry-tree grows to a stately size, and yields valuable timber. Some orchards of this kind, of five or six acres, pay an annual profit of £100, the fruit being gathered and sent to market at the expense of the purchaser, independently of the ground as a pasture.

But the most profitable kind of orchard is that which contains all kinds of hardy fruit-trees and bushes, and where the land is solely appropriated to that purpose. This kind resembles gardening more than farming, and is therefore unsuitable to large farms, but quite applicable to small ones, to which an acre of orchard, requiring no horse labour, would be of essential benefit. In such, half standard apple-trees are planted in rows eighteen feet from each other, the trees being twelve feet apart. In the same line with the apple-trees are planted either gooseberry or currant bushes, or, what pays equally well, filberts. The latter are not allowed to rise higher than about four feet, and kept spurred in exactly like the white currant. Gooseberries gathered green for tarts, pay the farmer better than when ripe, and are not nearly so troublesome in the carriage to market. As such an orchard is not to be grazed, two feet of the soil on each side of the rows of trees is kept bare, and always free from weeds. On this a mulching of rotten dung may be laid every winter, and raked off in the spring, upon the intermediate strips of ground to be planted with potatoes, or some with onions, turnips, scarlet runners, or any other crop which the cultivator can most advantageously dispose of in his neighbourhood.

For such an orchard, the earliest and surest bearing apples should be preferred. The greatest majority should consist of the hawthornden, the rest of the French-crab, and scarlet nonpareil. A few of the earliest pears may be intermixed, as the petit muscat, a kind which fetches a good price on its first appearance in the market. The most hardy and profitable kind of plum for a farm orchard is the common damson, it being always in request for baking, preserving, or for wine making.

In preparing the ground for an orchard, different methods are followed. When the spot is fixed on, the fence (if it requires one,) should be first executed. This is best done by a well planted white thorn hedge and ditch. The latter should be on the outside, and not less than three or four feet deep, to allow a bank of corresponding height. Young plants of the English elm should be planted with the thorns for a hedge row screen to shelter the fruit trees, except towards the southern exposure. The elms may be put in at six or eight feet distances, and as they bear lopping, they may be kept trimmed up to form, together with the hedge, a lofty narrow protection against wind.

The next thing to be considered, is, whether the ground is sufficiently dry. If not, rubble drains should be made across the slope, (if there be any declivity) into the lowest outside ditch.

The ground may be prepared for receiving the trees, either by trenching it wholly with the spade, fifteen inches deep, or with the trenching plough. This trenching is particularly necessary when the orchard is not intended to be a meadow or pasture. If the soil be thin, it may be ploughed into ridges six yards wide, twice gathered, which will give a sufficient depth of mould on the ridges to receive the trees. Another way is to trench beds eight feet wide for the trees, and prepare the rest of the ground with the plough and harrows, to be sown down with grass seeds and a single cast of a dwarf

growing oat, in the month of March after the trees are planted. There is still a cheaper way of planting an orchard on land which is already in turf, viz. digging or trenching pits six feet square for the trees. This is done by first taking off the turf, to be relaid when the tree is planted, stirring the soil in the pits eighteen inches deep, and adding, if necessary, a barrowful or two of maiden earth, mixed with a little rotten dung, to place the tree in. This plan may be pursued when the soil is of sufficient depth on a gravelly subsoil; but if on a clay subsoil, it is the worst way possible; because these pits become receptacles of stagnant water in wet seasons, and are of course injurious to the roots of the trees.

Whichever mode of planting is determined on, the openings should, in the first place, be made ready for the trees, which should be had from the nearest nurseryman, carefully taken up, and as carefully planted. If the roots are broken, or bruised, they should be smoothly cut back, and the shoots of the head pruned into about one third of their length, in the month of April, after the trees are planted.

For a farmer's orchard, which is also intended for a penn or pasture, the trees must be all standards, with stems six feet high. This precaution is absolutely necessary where cattle are permitted to range. They should be grafted on free stocks and true of their kinds. The sorts of apples before mentioned may be chosen; of cherries the caroun, of plums the damson, should be the principal. Any favourite sort of pear, or other fruit, may be added for the sake of variety. But there is a safe rule for the choice of fruit trees, viz. to prefer the kinds that succeed best in the neighbourhood; for it is certainly true that some sorts of fruits are affected by one description of soil, and local climate, more than others. This circumstance deserves attention.

Trees planted in rows at twelve feet apart from each other, and eighteen feet intervals between the rows, may be supposed to stand too thick; but as they will bear a good deal of fruit before they interfere injuriously, the underlings may be pruned away without regret when this takes place. The whole should be placed in quincunx order, as the one affording most air and light to each individual. It is almost unnecessary to add that every tree should be securely staked up, to keep them steady against wind, and be carefully cradled, or bushed before any kind of cattle are admitted into the orchard. An acre of orchard planted at the above mentioned distances, would require above two hundred trees.

BEDEGUAR OF THE ROSE.

BY MR. JESSE.

I HAVE often admired a small, round, mossy substance attached to a branch of the dog-rose growing in our hedges, and which I was unable to account for until the following circumstance was related to me by an ingenious florist and nurseryman in the King's Road. Mr. Knight, who informed me, that, having been requested by one of his customers to endeavour to preserve a favourite mulberry tree, which for many years had flourished on her lawn, but which, with the exception of one very large branch, was either dead or decaying, he waited till the sap had ascended, and then barked the branch completely round near its junction with the trunk of the tree. Having filled three sacks with mould, he tied them round that part of the branch which had been barked, and by means of one or two old watering-pots, which were kept filled with water, and placed over the sacks, from which the water gradually distilled, the mould in the sacks was sufficiently moistened for his purpose. Towards the end of the year he examined the sacks, and found them filled with numerous small fibrous roots, which the sap, having no longer the bark for its conductor into the main roots of the tree, had thus expended itself in throwing out. A hole having been prepared near the spot, the branch was sawn off below the sacks, and planted with them, the branch being propped securely. The next summer it flourished and bore fruit, and is still in a thriving state.

Having heard this fact, I examined the massy substance on the dog-rose, and found that, in consequence of the bark on the branch on which it was found having been removed by some insect, the sap in receding had thrown out roots, which, from the exposure of the air, produced the mossy ball in question, and which was probably made the nest or hybernaculum of some insect. If this mossy substance be examined, the larvæ of an insect will be found belonging to the genus cynips.

ON SANDY AND GRAVELLY SOILS.

BY COUNT GYLLENBORG.

Sand and gravel, which consist of a stony powder, or exceeding small stones, have no cohesion of their parts, whether wet or dry.

There is a kind of gravel which the country people make use of as mortar; but on trial, this appears to have in it a mixture of clay, which may be washed away; of calcareous particles, as appears by its effervescence with acids; and of chalybeate particles, which aqua regia extracts; whence it appears, that this gravel is a natural mortar.

As sand and gravel are vitriable, they give way to no menstruum. Neither water nor the most corrosive menstruums can separate any thing from them.

Some kinds of gravel become *adhesive*, on the addition of water, owing to a mixture of clay, as already observed; and on drying them they become very hard: which circumstances can be applied only to the above mortar.

Sand and gravel do not contribute at all to vegetation; neither *materially*, as nourishment, nor instrumentally, unless by accident, by the mixture of other earths. They indeed, render strong earths more porous and loose.

They render spongy turf more solid; and hence it is, that we find that the slime left in low places, becomes stronger by the mixture of sand, the sand and slime uniting into a more solid earth.

They admit the air to the roots of plants; and they facilitate the culture of the land.

Some think that flints and stones render the earth more fruitful, from a salt contained in them; but they are much mistaken. Flints and pieces of stone may become useful, from the shade they yield; especially if, by rising above the surface, they protect the plants from the heat of the sun; or, as water cannot enter them, all the rain that falls upon them goes to the plants and their roots; and hence it is, that grass looks so thriving around stones, provided there is a sufficiency of earth.

Gravel and sand become rather hurtful, by heating too much; for stones being denser than the earth, retain the heat longer, and are sometimes slower in admitting the cold. They render the soil too loose; whence water and the richness of the earth are soon lost, either by soaking through, or by being evaporated: and hence they easily admit cold to the roots of plants. Because of their hardness, they attract little or no moisture, or other matter from the atmosphere; so that neither mediately nor immediately, can they in any way contribute to the nourishment of plants.

What has been above said, shows, and experience proves, that sand is useful in wet and cold soils; and hence it may be concluded, that such soils may be usefully laid on sand.

In judging of land, particular regard must be had to the strata or layers underneath. The upper layer is sometimes poor when there is a richer soil beneath it; and at other times the upper surface is more friendly to the growth of plants, than what is met with lower down. What has been here said of the use, or of the advantages and disadvantages of the several soils, must be understood only of the *upper layer considered by itself;* knowing, at the same time, that the upper layer may be rendered better or worse by a mixture with the lower, according to the different qualities of each.

PLANTS INDICATING THE QUALITY OF SOILS.

BY MR. NEVIN, GARDENER TO THE CHIEF SECRETARY FOR IRELAND.

[The following paper upon a subject of great interest, we extract from the Irish "Farmer's and Gardener's Magazine," a spirited periodical, just commenced in Dublin, under the superintendence of two able editors, Martin Doyle and Edmund Murphy, to whose practical and praiseworthy undertaking we wish every success.—Editor.]

That a pretty correct estimate may be formed of the quality of a soil from the plants growing *spontaneously* thereon, every experienced agriculturist is ready to admit. It appears therefore a subject not of the least importance to ascertain whether some arrangement might not be adopted, whereby to determine the proper qualities of soils, simply from such indications. If this can be accomplished, we have undoubtedly an additional argument for recommending the study of plants botanically to the student of agriculture. In all such cases, a *scientific* knowledge should exist, not merely as regards the plants used in agriculture, but also with respect to those indigenous to the country.

Numerous indeed are the productions of the vegetable kingdom, and very different are the soils and situations where they are found; and although many of the same species grow in soils of the most opposite character, yet the qualities of soils may be very accurately ascertained by the plants that more especially predominate on them. An all-wise providence has, as well in the vegetable as in the animal

world, taught plants to seek the food best adapted for their nourishment. For example—as well might we expect the animals of the land to live in the sea, and, *vice versa*, as the plants of the mountain to exist where the floating aquatic flourishes in all the luxuriance of its native element.

Valuable and interesting as Sir Humphry Davy's Lectures on Agricultural Chemistry unquestionably are, yet when the *practical* farmer reads the following (which it may not be improper to extract), he must feel it more a matter of fine philosophy, than capable of being easily applied in his practice. In describing the necessary apparatus for analyzing a soil, Sir Humphry says, "The instruments for the analyzing of soils, *are few*, and but little expensive. They are, a balance capable of containing a quarter of a pound of common soil, and capable of turning when loaded with a grain; a set of weights from a quarter of a pound troy to a grain; a wire sieve sufficiently coarse to admit a mustard seed through its apertures; an Argand lamp and stand; some glass bottles, Hessian crucibles, porcelain, or queen's ware evaporating basins; a wedgwood pestle and mortar; some filtres made of half a sheet of blotting paper, folded, so as to contain a pint of liquid, and greased at the edges; a bone knife; and an *apparatus* for collecting and measuring *aeriform fluids*," &c. &c. This is all very well for the philosopher or chemist, but for every day use it appears anything but suited for the practical improver.

The present subject is one on which for several years I have bestowed some attention. The following Table is therefore submitted as the result of these observations.

INDICATORS OF QUALITY OF SOIL.		SOIL.	SUB-SOIL.
BOTANICAL NAME.	ENGLISH NAME.		
Tussilago Farfara, Stachys palustris, Holcus mollis,	Colt's-foot, Clown's All-heal, Soft Grass.	Clayey.	Retentive.
Ranunculus repens, Cnicus arvensis, Senecio Jacobea, Chrysanth. Leucanthemum, Plantago lanceolata, Bromus mollis,	Crow-foot, Field Thistle, Ragwort, Ox-eye Daisy, Rib Grass, Brown Grass,	Loamy.	Gravelly.
Spergula arvensis, Pteris aquilina, Lolium perenne, Triticum repens, Viola tricolor, Mentha arvensis,	Spurry, Brake, Rye Grass, Couch Grass, Heart's Ease, Wild Mint,	Sandy.	Gravel and Sand.
Hippuris vulgaris, Iris pseud-acorus, Pinguicula vulgaris, Juncus effusis, Cardamine arvensis, Orchis latifolius,	Mare's Tail, Yellow Iris, Butterwort, Soft Rush, Lady's smock, Orchis,	Marshy.	Clayey, or Clay and Gravel.
Eriophorum angustifola, Myrica gale, Sphagnum palustre, Comarum palustre, Equisetum palustre,	Cotton Grass, Sweet Gale, Bog Moss, Cinquefoil, Horsetail,	Boggy.	Loam, Clay, or Gravel, or decomposed Gravel, frequently at great depth.
Erica vulgaris, Erica carnea, &c. Vaccinum Myrtillus, Empetrum nigrum,	Common Heath, Purple ditto, Blackberry, Crowberry,	Sandy Peat.	Sand, or Freestone Rock.

ON THE STRUCTURE AND REPRODUCTION OF PLANTS.

BY W. RHIND, ESQ. SURGEON.*

Vegetables are, as it were, the clothing of the earth, without which, it would be bare, rugged, and unseemly; flowers, and shrubs, and trees, the ornamental embellishments which add beauty and splendour to the face of nature. There is a softness and appropriateness in the subdued tinge of green too, which is with very few exceptions the prevailing colour of the vegetable kingdom, something which is pleasing and refreshing for the eye to look upon, without being too glaring or dazzling.

Vegetables, though not possessing the structure and sensations of living animals, yet have a species of vitality of which inert matter is altogether destitute; they form a link, and a most important one, between dead or unorganized substances, as rocks, stones, &c. and animated beings.

Vegetables may be said to be almost the sole medium by which nourishment is first extracted from the earth, and water, and air, and so assimilated, as to form the food of animals and man; for we believe that the great mass of living creatures, either directly or indirectly, live on vegetable matter. Numerous quadrupeds derive their sole support from grasses, and many species of birds from grain and seeds; these become the prey of carnivorous animals, and afford them their whole means of subsistence. Fishes prey upon flies and insects, which, either directly or indirectly derive their subsistence from the vegetable kingdom; and man as well as some other animals, lives indiscriminately both on animal and vegetable matter.

It is an important office of vegetables, therefore, that, by their peculiar structure and functions, they decompose the air, the water, and, in all probability, the several salts of the earth, and recombine these again into new substances fit for the sustenance of the animated kingdom.

It is to the operation of vegetation, too, that we owe a considerable proportion of the soil which covers the earth. A seed of a moss plant cast on a barren rock will cling to it, and attracting moisture from the atmosphere, will spring out a living plant, produce seed, and then moulder into dust. Others, of the same kind, spring up from its ruins, and, feeding on the moisture and air, and the mouldering rocks beneath, in time accumulate a certain depth of soil, which still goes on increasing, till at last it becomes a deep bed, fit for receiving and nourishing other species of plants, that may be driven towards it by the agency of the winds, of birds, or other means which nature employs for the propagation of vegetables. In this manner, by the accumulation of decayed plants, mingled also with the dust of rocks and minerals, acted upon by the sun and air, have our deepest and most fertile soils derived their origin. We find also in peat-bogs an accumulation of decayed moss plants, extending sometimes to the depth of twenty or thirty feet.

Vegetables are organized substances, consisting of a complicated structure of tubes, and air cells, and various organs, all performing functions tending to the increase, preservation, and multiplication of the several species. They may, therefore, be looked upon as possessing a living principle; and though they have not sensations like animals, yet have what has been called irritability, which in many instances, presents phenomena very similar to those in the animal kingdom, as is exemplified in the shrinking of the sensitive plant when touched by the hand, the moving of the tendrils of plants towards the light and air, and the twining of many plants round other neighbouring substances for support.

Plants consist of a stem, with roots passing into the earth, of leaves, and of blossoms, or flowers, for the production of seeds. Throughout the stem and roots there is in most plants a series of tubes and air vessels, by which the sap passes from the soil up through the plant, and, combining with the vital air of the atmosphere, through the medium of the leaves, is elaborated into nourishment for the growth and development of its several parts. The outer bark of the plant consists of a thin membrane, somewhat like the skin of animals, and serves a similar purpose, to protect the parts beneath from the air and all external injury, serving also for the exhalation and absorption of moisture. Immediately under this skin is a soft pulpy structure, consisting of innumerable cells, being of a green colour in almost all vegetables. Of this kind of structure too, the leaves of plants are composed. Under this cellular substance we find in woody plants the true bark, or liber, composed of numerous fibres running in a longitudinal direction, and having the appearance when slightly macerated, of a fine net work. In this portion of the bark the peculiar virtues of plants principally are found; such as those characterising gums, resins, cinnamon, essential oils, the astringent matter of the oak, &c. The wood is found immediately under this, in circle within

* From "Studies in Natural History."

circle, extending to the heart or pith, which is situated in the centre. The outer circle of wood next the bark is softer and whiter than those in the centre; and as a circle is formed each year, the number in a tranverse section near the root denotes the age of the tree.

Throughout the woody fibres, but especially the outer circles, there are numerous sap vessels, extending in a longitudinal direction, and mixed with these many cells, generally of a hexagonal shape.

The pith is situated in the centre; and in young growing plants is large and juicy; but in older ones it becomes small, and light and cellular.

Its proper use is not exactly ascertained. Some are of opinion that it is essential to the plant, in order that it may throw off shoots and branches; others, for supplying moisture to the leaves, when there is an excess of perspiration. In few herbaceous plants is there any pith; the proportion of cellular substance in these stems is greater than in those of woody plants; and there is rarely any appearance of concentric circles in a transverse section.

The leaves of plants are most important appendages and may be compared in some degree to the lungs of animals. Plants will not thrive if deprived entirely of their leaves, or if these have not free access to the air. The juices of plants, while circulating through the minute vessels of the leaves, undergo a change very important in their own economy, and by which the purity of the atmosphere is most materially affected. The leaves also absorb and give out moisture, as the economy of the plant requires. In spring, when after a season of torpidity, the regulating powers of vegetables are called into activity, the sap, extracted from the soil by the fibrous roots, mounts up through the vessels of the plant with surprising force and impetus. After undergoing a change in the leaves, it descends through the plant, and gives out to the various parts, the peculiar substances which enter into their formation, and which form the distinctive qualities of the particular plant. During the day, and in the sunshine, plants absorb the carbon and azote of the atmosphere, and give out or set at liberty, the oxygen or vital principle; but it is found that during the night this process is reversed, carbonic acid being given out, and oxygen absorbed.

Light, as well as air, is essential to the proper growth of vegetables; for almost all plants growing in the dark are of a pale sickly aspect, altogether devoid of colour, which may be seen every day in potatoes vegetating in dark cellars; it is singular, also, that if the least ray of light streams in through a small aperture, the shoots of these potatoes will be found directed to it, and spreading out to meet the light, as it were by a sort of instinctive impulse.

The roots of many plants consist of a covering of bark and a fibrous structure, similar, in a great measure, to the stems. The office of the roots is to absorb the juices from the soil. That water forms a considerable part of the food of plants is extremely probable; but that other ingredients of the soil, such as the saline parts, extractive matter, &c. enters into their composition, is also pretty evident. Some botanists have doubted whether plants derive any part of their nourishment from the earth, maintaining that they grow by the decomposition of air and water alone; but, besides many proofs by direct experiment to the contrary, we think it is evident that they do derive much of their substance from earth, from the circumstance that many animals purely graminivorous, not even requiring water, as rabbits, sheep, &c. have phosphate and carbonate of lime in the composition of their bones, which, as far as we know, could only be afforded by vegetables assimilating such matters from the soil.

It is found, however, that pure earths alone will not answer the purposes of vegetation, the various salts and extractive vegetable matter being useful either as stimulants, or as entering directly into their formation. This is the reason that manure is so essential for the ground, and that its annual renewal is necessary, if full and luxuriant vegetation is expected. When one kind of vegetable is planted successively on the same soil too, it exhausts it by extracting the particular substances which enter most abundantly into its composition; and hence the annual change of crops, which farmers know so well to be necessary.

Nothing more beautifully demonstrates that nature, through all her works, proceeds on a uniformity of plan and design, than the fact, that plants as well as animals are possessed of organs necessary to accomplish the great end of nature,—the re-production and continuation of their species. The pistil which occupies the centre of the flower, is designed to produce the seeds; while the stamens of the plant contain a peculiar substance necessary for fertilizing them, without which substance coming in contact with the pistil, the seeds are incapable of re-producing the plant.

Although Linnæus did not make this discovery, it is to him we owe its complete elucidation.

From remote antiquity, the importance of these organs, in perfecting the seed, has been known; but it was not until 1730 that Linnæus established a fact so long in dispute, and proved the stamens and pistils to be essential to every plant.

A plant may want its leaves, and blossom: but these organs must be present. An example of this is found in the common mare's tail of our ditches. Here a stamen and pistil present themselves, but no corolla, and scarcely any vestiges of calyx or flower-cup. In most animals these organs are separate, there being a distinct male and female creature; while in the majority of the more highly or-

ganized vegetables they are united in one flower, although numerous examples are not wanting of a different arrangement, as the hazel, oak, birch, &c. We find some flowers having stamens, and others pistils; while, in another division, the stamens and pistils are on different individuals. Of this the willow is a familiar example. The date-tree furnishes another: and at a very early period the Greeks discovered that, in order to have abundant fruit, it was necessary to plant male and female trees together.

MANAGEMENT OF CUCUMBERS.*

The cultivation of the cucumber, at an early period of the year, is attended with considerable risk and difficulty, especially when grown on dung beds, as the steam and moisture, arising from the dung, are very liable to damp and injure the plants; particularly when the weather continues, for any length of time, in such an unfavourable state as to prevent a free circulation of air being admitted into the frame.

When this fruit is wanted at an early period, the seed should be sown the latter end of November, or beginning of December. Previous to sowing it, there should be a one or two-light box or pit prepared, in thickness of not less than four to five feet, of well concocted dung, or leaves and dung well mixed; these ingredients should be two or three times turned together previous to using, and allowed to ferment for about three weeks before it is made up into a bed, which will then become sweetened, and will retain the heat much longer than if made up in a recent state. When the bed is composed to the depth above specified, the lights should be kept close shut up two or three days, to assist in drawing up the heat, which will soon arise, when plenty of air must be admitted, to allow the rank effluvia from the bed to pass away. As soon as the violent heat has subsided, the bed may be moulded over to the depth of three or four inches, and the seed sown in pots from four to five inches diameter, and plunged in the mould half way to the rims.

In the course of a few days after the seeds are sown, the cotyledons of the plants will begin to make their appearance; and when these are fully expanded, and the plants about two inches high, it will be time to remove them into other pots; by placing three plants in each, and giving a gentle watering, with water of the temperature of the bed, to settle the soil about the roots.

Much care and attention are required at this critical season, to prevent the plants from damping off; and the linings round the beds will require frequent turnings, and additions of fresh dung, to prevent the heat from declining, which would otherwise soon become not of a sufficient warmth for the plants.

The fruiting bed should also be got in readiness, and made according to the directions above-mentioned, at this wintry period of the year.

It is very desirable to have a strong body of the fermenting materials together, for the purpose of keeping up a good heat throughout the severest months; but as the season gets advanced, the beds may be prepared of less thickness than that specified. When the first or second rough leaf makes its appearance on the seedling plant, it will be time to begin to prepare and mould the beds upon which they are destined to produce their fruit. The soil should be collected under each light to the depth of twelve inches, and formed into round hills; the top of which should be kept, at the first formation, pretty near the glass, as they will be sure to subside. The mould in which the cucumber will grow freely and produce fruit, is one half of maiden loam, one fourth leaf mould, and one fourth of decomposed good stable dung; which ingredients should be well incorporated together previous to using, and spread over the surface of the bed for a few days, before gathered into hills for the reception of the plants. As soon as the mould is in a warm and congenial state, the plants may be removed from the seed-bed and committed to their final situation, placing three plants in each hill; they should likewise have a little water to settle the soil about their tender fibres, which should be given of the same temperature as the atmosphere of the frame, as water, at this season, without the cold air being taken off, would chill and injure the plants. During the winter months, the cucumber requires a higher temperature for its preservation, than even the pine apple; consequently the atmosphere in the cucumber frames should not be allowed to fall under seventy degrees, and should be permitted to get as high as eighty or eighty-five degrees by sun-heat. The external dung linings will require to be frequently turned, and fresh dung added to renew the heat.

Air should likewise be admitted at all favourable opportunities; in short, even in the most severe weather, a little ought to be given daily, which will encrease the vigour and health of the plants, as nothing is more pernicious to their growth, than being shut up for any continued time without it. When the dung that is applied to the exterior of the pits is in a rank state, it will sometimes appear necessary to leave the lights a little tilted behind during the night, so as to allow the steam that may collect in the frame to pass away. The ends of the mats must, however, be lapped over the apertures thus left, otherwise the frosty winds will be liable to in-

*From "Forbes's Hortus Gramineus Woburnensis." The Editor takes this opportunity also of mentioning that he was wrong in attributing the Salictum Woburn. to Mr. Sinclair, it being the work of Mr. Forbes.

jure the plants. When the weather is very severe, the beds, or pits should be covered early in the afternoon, with two or three tiers of mats, and not uncovered before nine o'clock in the morning. When the fruit blossoms begin to make their appearance, it will be necessary to assist nature at an early period of the year, by taking off the male flower, and inserting its anthers into the fertile blossoms when it is fully expanded, as the limited admission of air that is given, in the winter season, is not sufficient for the dispersion of the pollen for impregnation, without which the fruit will not swell; but at a more advanced period of the year, the current of air, and the bees that generally frequent the cucumber and melon bed, are the best and most natural sources of fertilization. As the plants advance in growth, they should be regularly pegged down to the surface of the bed; also gradually adding mould to their hills, until the entire bed is covered over to the depth of a foot or fourteen inches. Occasional waterings will be required; but care must be taken not to give them in such quantities as will sour and saturate the soil.

The dung linings which surround the bed, will also require to be frequently attended to, and renewed, in order to keep up the requisite degree of heat amongst the plants.

Should there have been a favourable portion of sun throughout the month of February, the plants will then be shewing fruit, and will be fit for cutting by the beginning or middle of the ensuing month. When a large supply of this fruit is wanted, a succession of crops will require to be kept up, by ridging out young plants every month or six weeks, till June, when the plants put out on the ridges, for prickly cucumbers, will keep up a supply till they are destroyed by the frost.

The plants in the frames will require to be looked often over in the course of the season, and thinned out by removing such superfluous and decayed shoots as may appear; they will also require large supplies of water throughout the summer months; by all which processes they may be kept in a productive state for eight or nine months in the year.

Cucumbers may be also successfully grown and brought to perfection in the winter months, on the back flue or front curb of a pine stove, or in any other compartments in which the temperature is kept from sixty-eight to seventy, or seventy-five degrees; and when the plants can be placed so as to receive the full benefit of the sun and light in the gloomy months. The most successful cultivator of this fruit, at an early period, that I have yet seen, is Mr. Forrest, at Sion Gardens, who grows it in great perfection in the winter season, and who has got a particular sort of cucumber, that he calls the Sion Free Bearer, which is well adapted for winter culture, and produces fruit in great abundance in the pine stoves, from November until the other sorts come in, in the regular frames. The seeds of this kind are sown in August, and nursed in small pots until fit for planting out; when the plants are placed in boxes about two-feet long, and which are made so as to stand on the top of the back flue of the pine stove, where they are placed. There is also a trellising for training them, formed over the back part of the pine-house, where the plants are exposed to the greatest degree of heat and light in the house.

This method appears to be most simple and effectual for procuring a crop of cucumbers in the winter season, that I have ever seen. It is a plan that has been long pursued by Mr. Aiton, in the Royal Gardens, although not perhaps with the same degree of success; the stove in these gardens being not so well adapted for the culture of this plant, as those at Sion, which have also the advantage of a steam boiler, whereby the house can be at pleasure filled with vapour, which is known to be most conducive to the health and vigour of the cucumber plants.

CUCUMBERS CULTIVATED.

Lancashire Prize Fights,	Superlative,
White Turkey,	Early Short Prickly,
Green Turkey,	Sion Free Bearer.

ON APPROACH IN LANDSCAPE GARDENING.

Architecture requires symmetry; the objects of nature, freedom; and the properties of the one, cannot, with justice, be transferred to the other. Choice, arrangement, composition, improvement, and preservation, are so many symptoms of art, which may occasionally appear in several parts of a garden, but ought to be displayed, without reserve, near the house; nothing there should seem neglected; it is a scene of the most cultivated nature; it ought to be enriched; it ought to be adorned; and design may be avowed in the plan, and expence in the execution.

Even regularity is not excluded: so capital a structure may extend its influence beyond its walls; but this power should be exercised only over its immediate appendages; the platform upon which the house stands, is generally continued to a certain breadth on every side; and whether it be pavement or gravel, may undoubtedly coincide with the shape of the building. The road which leads up to the door may go off from it in an equal angle, so that the two sides shall exactly correspond; and certain ornaments, though detached, are yet rather within the province of architecture, than of gardening;

works of sculpture are not, like buildings, objects familiar in scenes of cultivated nature; but vases, statues, and termini, are usual appendages to a considerable edifice; as such they may attend the mansion and trespass a little upon the garden, provided they are not carried so far into it as to lose their connection with the structure. The platform and the road are also appertenances to the house; all these may, therefore, be adapted to its form; and the environs will thereby acquire a degree of regularity; but to give it to the object of nature, only on account of their proximity to others which are calculated to receive it, is, at the best, a refinement.

Upon the same principles, regularity has been required in the approach; and an additional reason has been assigned for it, that the idea of a seat is thereby extended to a distance; but that may be done by other means than by an avenue; a private road easily known; if carried through grounds, or a park, it is commonly very apparent; even in a lane, here and there a bench, a pointed gate, a small plantation, or any other little ornament, will sufficiently denote it; if the entrance only be marked, simple preservation will retain the impression along the whole progress; or the road may wind through several scenes distinguished by objects, or by an extraordinary degree of cultivation; and then the length of the way, and the variety of improvements through which it is conducted, may extend the appearance of domain, and the idea of a seat, beyond the reach of any direct avenue.

An avenue being confined to one termination, and excluding every view on the sides, has a tedious sameness throughout; to be great, it must be dull; and the object to which it is appropriated, is, after all, seldom shewn to advantage. Buildings, in general, do not appear so large, and are not so beautiful, when looked at in front, as when they are seen from an angular station, which commands two sides at once, and throws them both into perspective: but a winding lateral approach is free from these objections; it may besides be brought up to the house without disturbing any of the views from it; but an avenue cuts the scenery directly in two, and reduces all the prospect to a narrow vista. A mere line of perspective, be the extent what it may, will seldom compensate for the loss of that space which it divides, and of the parts which it conceals.

ON THE HEAT OF VEGETABLES.

BY SIR HENRY STEUART, BART. LL.D. F.R.S., &c.

It has been doubted by some phytologists, whether trees generate heat. I believe it is certain, that frosts of very extraordinary severity will destroy trees. The nonconducting property of wood, may, in some measure, protect the juices; but their chemical composition is such, that they do not congeal, unless the cold be of the severest sort and many points below the freezing point of water. In weather so hard as to occasion the juices to freeze, the wood, in the act of congelation, is violently rent asunder. But in the more common destruction of woody plants, it is not so much the degree of cold that kills them, as the too sudden reapplication of heat.

The ingenious Hassenfrats, to whom the chemical world is under some obligations, held, that vegetables are not fed by carbonic acid. In a memoir on the nourishment of vegetables, read in 1792 to the Royal Academy of Paris, having shown, as he conceived, that water and air are insufficient for all the purposes of vegetation, he attempted in a second ingenious paper to prove, that carbonic acid gas is not decomposed and digested in the organs of growing vegetables, and that they cannot be fed by it; because oxygen, escaping from combination in the decomposition of carbonic acid, and water escaping in vapour in the state of gas, would absorb caloric, and produce cold; whereas by the experiments of the late John Hunter, living vegetables contain a degree of heat greater than that of the surrounding atmosphere. The reason of this difference in opinion between these two accurate enquirers may possibly be, that Hunter's experiments were made only in the autumn, the winter, and early in the spring, when the activity of vegetation was suspended, which does not seem to have been the case respecting those of Hassenfrats.

It appears, however, that both Rüchert and Senebier ascertained, that vegetables do decompose carbonic acid, retaining the carbon, and emitting the oxygen. Dr. Woodward made many experiments with plants of mint growing in water; and found that a plant, in water from the Thames, which must certainly have contained a large share of carbonic acid, encreased considerably more in weight, than a plant growing in pure water. Schoppet, who examined the temperature of growing trees in New York, found, that from November to April, when the bulb of a thermometer was put into a hole made in a tree, the mercury rose higher than in the open air. And Ingenhoutz found, that a piece of green paper hung on a tree, in a warm summer's day, felt sensibly warmer than the leaves. Hunter, likewise, who was fond of trees, used to keep thermometers in them for months together, and obtained similar results. The subject is curious, and is the more deserving of the planter's investigation, that the state of the bark, and its power, when thick and indurated, to protect the sap-vessels, are so intimately connected with all facts, that tend to illustrate the subject.

ON THE EVAPORATION OF PLANTS.

BY KURT SPRENGEL, OF BERLIN.*

In the parched deserts of Africa, where the quantity of rain in a century rises scarcely to the height of an inch, the most juicy plants are often found to grow to an astonishing height. They can only be nourished by means of their surfaces. In hot-houses, too, we never attain a brisk growth so much by watering the roots of the plants, as by an artificial wetting and sprinkling of the plants from above. Evident as all this is, it is still a difficult matter to explain this absorption, upon common principles, through the closed sides of the cells. We might indeed ascribe this effect to the under surface of the leaves, on which principally the slits are seen; but as dew and rain much more frequently fall than ascend, we cannot avoid confining this absorption of the vapours and fluid drops, to the upper surface, on which supposition, we are again forced to betake ourselves to an organic perspiration.

The evaporation of leaves, is one of the most obvious and important of their functions. No person can deny it, who has noticed the drops of clear moisture on the points of leaves even in hot-houses, where they cannot be affected by the dew; or who has traced the movement of a mist in a still evening, as it raises itself from fields planted with vegetables; or who has seen the rising of clouds from forests, and the ascent of vapoury columns from the same places before the formation of a storm. In fact, plants lose, by evaporation from their leaves, the greatest part of the moisture which they take in by their roots. The proportion of the water absorbed, to that lost by evaporation, is as fifteen to thirteen, seldom as four to one. It is hence that a branch without leaves, when it has been placed in water, becomes heavier than one in a state of frondescense, because it wants the organs through which it may rid itself of its superfluous nourishment. The organs which are chiefly employed in evaporation, are the slits, and also the hairs, which latter organs are, therefore, more abundant in young shoots, and in those parts whose evaporation is most active.

Evaporation has an essential influence on the economy of the plants themselves, and on the whole economy of nature. The activity by which the plant empties itself of its superfluous matters, operates as an incitement to the other functions, and a plant is, in truth, the more healthy, the more freely it evaporates. Yet there may be an excess in this also, especially, when not only unformed juice, but the prepared and proper sap is given off.

The evaporation of leaves has a great influence on the general economy of nature. As in the transition from the form of drops to that of vapour, a greater portion of heat is consumed, the quicker this transition takes place; we find, in this fact, a principal cause of the low temperature which the juice of living plants exhibits, even during the greatest summer heat. Nay, the shade of a leafy tree will always afford a greater coolness to sentient animals, than the shade of lifeless objects.

The influence which the evaporation of leaves has upon the whole atmosphere, as well as upon the earth and its waters, produces very extensive effects. Forest regions are not only cooler, but also more productive of rain, than steppes and sandy deserts, where vegetation is entirely wanting. All the streams of the world have their sources in mountain chains covered with woods; and although the melted snow is their immediate cause, they would neither continue to be poured along, nor grow to a river, unless forests and woods, by their evaporation, incessantly afforded the necessary stores of water. The largest rivers in the world flow in South America, in Upper India, and in Northern Asia, through forests of immeasurable extent.

STING OF THE NETTLE.

BY PROFESSOR DRUMMOND, OF BELFAST.†

Three species of nettle are natives of Great Britain; the Roman nettle, the common nettle, and the small. The first is limited to certain situations, but the other two are found almost everywhere. The common or large nettle is known by grievous experience to every one, though perhaps you have never yet enquired whence the pain arises from touching it. You have often been pricked with a pin or needle; but you will recollect that the pain succeeding that injury is very different from what follows the stinging of a nettle. Now, the wound made by either of these, is, perhaps, twenty times

* From the German.

† From his "Letters."

larger than that made by the sting, so that in the operation of the latter there must be something more than the mere extent of the wound to account for the greater pain which is produced. In fact, it is a process altogether analogous to the stinging of a bee, or the bite of a venomous serpent. The sting is not like a pin or needle, solid throughout, but is hollow in the centre, and perforated at the point; and when touched, it is not only sharp enough to pierce the skin, but also is so constructed as to inject a particle of poisonous fluid into the wound it makes, and that is the source of the pain which follows. The wound itself is so minute, it would scarcely be felt, but the poison irritates, inflames, and causes the well-known pain alluded to.

The poison fang of the serpent is, in some respects, different from the sting of the nettle. There is a gland on the cheek which secrets or forms the poison, and this is conveyed by a duct, and discharged into a bag, which serves as a reservoir. With this reservoir the base of the fang is connected in such a way, that, when the point of the fang presses against an object, the resistance pushes its root into the poisonous fluid, and this, of course, passes into the cavity of the fang, and is ejected from its aperture, which is a slit at some distance behind the point.

Were it not for this poison, the bite of a serpent would only cause a simple punctured wound; but by the contrivance mentioned, it produces death in a very little time, even in the largest animal which the serpent will attack. Let us not pass over this subject without a little reflection. It offers us a striking example how the Almighty can turn simplest circumstances into the most important. Only a small number of the serpent tribe are armed with the poison apparatus; the rest have simple teeth, and take their prey by suddenly twisting round its throat and strangling it. The poisonous serpent, on the other hand, merely gives its bite, and then watches the animal bitten, till it falls dead.

We have the dreadful venom of the serpent elaborated from its blood by a small gland placed upon the cheek, and to analogous process we are to refer the poison which produces the stinging pain of the nettle. Heat plant, the small species of which (Artica lireas) stings the most severely, is covered all over with hairs; but by using a microscope, or a magnifying glass, you may perceive that these are not all of one kind; some being perforated, which are the stings, while others are not. Each sting stands upon a pedestal, and this pedestal performs the office both of gland and poison bag. It is cellular and spongy within; the sting is placed on its top, and may be moved by a slight pressure to either side, or round in a circle; it seems to stand, as it were, on a universal joint. When a body touches its point, the base is pressed down into the spongy pedestal, and the poisonous fluid rushes up through the tubes of the sting, and flows out of the terminal apertures.

HARMONIES OF COLOUR AND FORM IN PLANTS,

BY T. CASTLES, M.D., F.L.S.*

Nature, in the creation of the universe, has very beautifully moderated the influence of colour. To the firmament, she has given a beautiful azure tint; to the earth itself, a variety of shades, all more or less harmonizing with the blue on high, and the agreeable green of plants. If she had given to plants a yellowish hue, they would have been confounded with the soil; and if she had dyed them blue, they would have been confounded with the sky and waters. In the first case, all would have appeared earth, in the second, all would have been sea; but their verdure forms the most delightful contrast between them and the grounds of the grand picture, as well as consonances highly agreeable with the yellow colour of the earth, and with the azure of the heavens.

In giving to vegetable productions a green shade, though only one single colour is employed, there are certain tints which appear to be given according to the situation or circumstances under which a plant may grow. Those that are destined to grow immediately on the earth, on strands, or on dusky rocks, are entirely green, leaves and stem: as the greater part of reeds, grasses, mosses, taper-trees, and aloes; such, on the contrary, as are intended to issue from amidst herbage, have stems of a brownish hue, like the trunks of most trees and shrubs. The elder, for example, which thrives in the midst of green turf, has the stem of an ash-grey; but the dwarf elder, which otherwise resembles it in every respect, and grows immediately on the ground, has the stem quite green.

Not only the green of the plant is given to harmonize with other objects, but even the flower and fruit have their shades apparently proportioned accordingly.

It seems correct that the blue colour is not to be found in the flowers or in the fruits of lofty trees, for, in that case, they would assimilate with the sky; but is very common on the ground in the

* From his Introduction.

flowers of herbs: as in the corn-bottle, the icabiosa, the violet, the liver-wort, and others. On the contrary, the colour of the earth is very common in the fruits of lofty trees: as in those of the walnut, the cocoa, the pine, and so on.

In the form of flowers, the most perfect specimens of harmony might be selected, which would faithfully shew, that even in pleasing the sight, the greater object of utility is combined, if not increased.

This is very sweetly shown in the structure of compound flowers, particularly such as the sunflower and daisy. What would these flowers be in appearance, without their radii? Yet are the radiated petals of the circumference, not only given to complete a pleasing harmony of sight to the tubular florets of the centre, but they answer as important purpose of moderating the influence of heat, &c. thus is the double object of utility and beauty combined.

Another point productive of some very pleasing deductions, is founded on the harmonies from contrast. Plants opposite in nature, are almost always associated.

Thus round the faded trunks of trees, twines the creeping ivy, or the great convolvulus, compensating the apparent want of blossom. The fir rises in the forests of the north, like a lofty pyramid, of a dark green colour, and with motionless attitude. Near this tree, you almost always find the birch, which grows to the same height in the form of an inverted pyramid, of a lively green, and whose moveable foliage is incessantly playing with every breath of wind. The reed, on the banks of rivers, raises erect into the air its radiated leaves, and its embroidered stems, while the nymptæa spreads at its feet its broad heart-shaped leaves, and its gold coloured flower; the dark blue violet is contrasted in the spring with the yellow tints of the cowslip and the primrose. On the herbaged angles of the rock, the fungus, white and round, rises from amidst beds of moss of the most beautiful green.

DESCRIPTION OF THE PLATES.

TRYPETHELIUM SPRENGELII, ACH.

T. Sprengelii, Ach. *Lyn. Meth. Lich. p.* 18. t. iv *f.* 8,9.—Fée, *Meth. Lich., p.* 24, *t.* 1, *f.* 18. *Ejusd. Essai Cryp écore exot. offic, p.* 65. *tab.* xix. *f.* 1 —*Spreng., Syst. Vegetab.*, iv, 1, *p.* 348.

T. Elentheriæ, Spreng., Anlist A nlest zu kent. der Gervasch., etc. 3, *th.*, *p.* 350, *t.* x. *f.* 95.

Thallo (crusta) fulvo-flavescente, effuso, lævi.

Apotheciis (verrucis) nerinsphæricis, glabris, subnitentibus fusco-ferrugeneis; Thalamcis (E 16) subglobosis; Perithecro crasso, ater-rimo, nuclee albido; Sarcothecio fulvo.

Habitat in America ad corticem Crotonis Cascarillæ, nec non in Peruvia ad corticem Bonplandiæ trinoliatfæ, *Icon. tab.* xi. *fig.* 1, A, magnitudine naturali; B, fragmentum auctum: C, apotherium horizontaliter sectum; D, theca; E, gongylus.

This plant abounds on the bark of several trees in Peru, St. Domingo, and Guadaloupe, and probably in many other localities.

PHLOMIS LYCHNITIS.

Didynamia Gymnospermia, Linn.; Labiatæ, Jussieu.

Calyx angulatuz; corollæ labium superius incumbens, compressum, villosum.

Phlomis Lychnitis, foliis lanceolatis tomentosis, floralibus ovatis, involucris Setaceis lunatis.

Sp. Pl. 819 *Reich.* 3 *p.* 70. *Mill. Ic.* 204. *Mart. Mill. Dict. n.* 5. *Hort. Kew*, 2. *p.* 308.

Phlomis Lychnitis. *Clu. Hisp.* 379. *Hist.* 2. 27. *Tourn. Inst.* 178. *Pena in Hist. Lugd..* 1303. *Ed. Gallic.* 2. *p.* 194. *D'Assa. Arrag. n.* 536. *Ger. Prov.* 264 2, *Villars Dauph.* 2, *p.* 393. *Quer. Flor. Espan. v.* 6. *p.* 95. *Allioni Fl. Ped.* 121. *Willd. Sp. Pl.* 3. *p* 119. *Brot. Flor. Luset. v.* 1. *p.* 166.

Phlomis foliis legulatis utrinque tomentosis, radiis involucri setaceis villosis. *Suav. Mosp.* 143.

Verbascum angustis Salviæ foliis. *Baugh Pin.* 240. *Ger. emac.* 767. *Raii Hist.* 511.

Verbascum sylvestre foliis salviæ tenuifoliæ. *Lob. Ic.* 558. *f.* 1. *et* 2. *advers. p.* 241.

Verbascum sylvestre monspeliense, flore luteo triante. *J. Baugh. Hist* 3. *p.* 307, quoad descriptionem.

Stadrys prælongo angustoque folio, flore luteo. *Barrel, Ic.* 1321.

Salvia fruticosa lutea angustifolia. *Park. Theat.* 51. *f.* 10.

Among the figures above quoted, those of Clusius and Pena, Barrelier and Philip Miller, are the only original ones. Of these, that of Pena expresses the habit of the plant the best, but was taken after the flowers had dropped off; in which state the specimens in herbariums are often found. Perhaps it was this circumstance that misled Linnæus when he describes the corolla "as scarcely larger than the calyx."

It is a native of the south parts of France, Spain, and Portugal; growing chiefly on dry gravelly hills; is said to be particularly abundant about Montpelier, and in similar soils in other parts of Languedoc.

It owes its specific title of Lychnitis, as well as its Spanish name Candelero, to the use to which the long slender radical leaves are applied, as wicks for lamps; which purpose they are said to answer very well, even in their recent state.

It was cultivated by Miller, in the Physic Garden at Chelsea, in 1731, but may be considered with us as a very rare plant. It is generally treated as a green-house shrub; but in a sheltered situation and dry gravelly soil, it would probably do much better in the open air. It flowers in July.

IRIS LURIDA.

Triandria Monogynia, LINN; Irideæ, JUSSIEU.

Calyx, sheaths bivalve, separating the flowers, permanent.
Corolla six parted. Petals oblong, blunt; the three exterior ones reflexed; the three interior upright and sharper; all connected at the claws into a tube of different lengths in the different species. Stamens, Filaments three, awl-shaped, incumbent on the reflex petals. Anthers oblong, straight, depressed
Pistils with the seed organ, inferior, oblong, style simple, very short; summits three, petal form, oblong, reeled within, furrowed without; incumbent on the stamens, two lipped. Outer lip smaller, and notched; inner larger, forked and sabinflected.
Capsule oblong, cornered, three-celled, three-valved.
Seeds several large.
The nectary in some (1.9.) is a longitudinal villose line, engraven on the base of the reflex petals; but in others it consists of three melliferous pores at the base of the flower. The capsule in some is trigonal, in others hexagonal.
Iris lurida.
AIT. *Hort. Kew* 1, 68.

BEARDED, stem higher than the leaves, and many flowered, outer petals rivolute, inner from erect bent in, somewhat waved and slightly emarginate.

ALOE LINGUA VAR. A

Hexandria Monogynia. LINN; Hemerocallidiæ, JUSSIEU.

Aloe lingua; acaulis, curviflora, foliis distochis, base imbricate, conduplicantibus, linguæ formibus, punctulis instar araneæ cuticulæ prumatis, variegatis, corolla subampallacea, laciniis breviter coalitis.
Aloe Africana flore rubro, folio maculisub utraque parte notato. *Knorr. Thes. Rhei. Herb. v.* 3 *A. t.* 14. *Comm. Hort Amst.* 2. 15. *t.* 8.
Aloe Africana maculata flore rubro, secund species. *Wernm. Phys. Icont.* 57
Aloe africana foliis linguam vitulinam exprimentibus. *Sabbat. Hort. Rom.* 6 *t.* 71.
(Aloe a lingua di vitello). (E) foliis latioribus obscurius variegatis. *G.*
Aloe obliqua. *Jucq. Hort. Schœnb.* 4. *t.*
Aloe nigricans. *Haworth. Linn. Trans.* 7. 13.

THIS plant grows with its leaves, near the ground. These are about six inches in length. The flowers are in slender and loose spikes, each hanging downwards, of a red colour at bottom and green at top.

BIGNONIA VENUSTA.

Didynamia Angiospermia, LINN; Bignoniæ, JUSSIEU.

Calyx 5-fidus, cyaithformis; corolla, fauce campanulata, 5-fida, subtus ventricosa; Siliqua 2-locularis; semina, membranaceo-alata.
Bignonia venusta scandens; foliis glabris, infesiorbus ternatis ecirrhosis, superioribus conjugatis cirrhosis, foliolis oblongo-ovatis acuminatis basi inæquilateri-oblignis, petiolis intri villosis; calyce brevi cylin drico-rotato æquali denticulis 5-teretibus villosis invincem distantibus, pedimentis corymboso —pluri-floris.

THIS splendid plant was received about fifteen or twenty years ago from the Brazils, by Lady Liverpool, and flowered first in this country in 1818, in the hot-house at Coombe Wood. The figure in our plate was drawn and engraved from a specimen sent us by Mr. Forbes of Woburn Abbey, accompanied with the following letter:

"Woburn Abbey, Jan, 21st, 1834.

"Sir,—I herewith send you a specimen of the *Bignonia Venusta*, which is at present in flower, in the Garden of R. Trevor, Esq., Tingrith, who very kindly sent this specimen over to me this morning, to forward to you, should you consider it worth a place in your Magazine. I believe it is very rare to see this species of *Bignonia* in flower. This plant is growing in a corner of the pine stove at Tingrith, and the roots are nourished by the tan-bed, and frequent waterings with liquid manure, which induces it to grow luxuriently every year; and has produced this, and last year, an inconceivable multitude of blossoms. The shoots are trained along the back of the pine stove, as well as down every rafter; and when in flower, they have really a magnificent appearance.

"I understand that Mr. Phillips, Mr. Trevor's gardener, has sent specimens of it to Mr. Loudon, lately, with the particulars, relative to his management of it; which he informs me, is to appear in the next Magazine. If you should notice it in your Magazine, you will of course mention the garden where it has been brought to such high perfection in.

"I remain, Sir, your very obedient servant,
"J. FORBES."

The following is the article by Mr. Phillips, above alluded to:—*B. Venusta* appears to like free scope for its roots. We have here two flowering plants, which are planted in the back corners of the bark-bed, in boxes one-foot square and five-feet deep, formed of perforated boards, and filled with a mixture of sandy loam and leaf mould. The roots have passed out of the boxes into the decayed bark of the bark bed, in which there is always a gentle heat, and in which they grow and spread very freely. We water liberally with the drainings from the hot beds and rain water. The plants are trained perpendicular, with a single stem, now three-inches in girth, to the points where they touch the rafter; and to this point the branches, when they have done flowering, are always cut back, while at the same time the bark-bed is renovated, and the roots reduced. When the grape-vines are taken out, we lead the shoots of the bignonia along two wires close under the rafters over the path a foot from the grass. When the grape vines are taken out, we lead the shoots of the bignonia down the rafters, and, in its flowering season, it may be said to cover the whole house; and it has a most splendid appearance.

In 1831-2, the B. Venusta began flowering on October 3; in 1833, two or three weeks later. It continues blossoming between three and four months, and some of the finest specimens have upwards of seventy flowers in a corymb. A branch introduced into the greenhouse has flowered sparingly. Cuttings of the young shoots, when about 9 inches long, will strike root freely in a hot-bed.

1 Fragaria Monophylla.

2 Flanklins Tartar

3. Primula Villosa

4 Eranthus hyemalis.

5. Schizanthus retusus.

6. Grewia elastica.

7. Meconopsis aculeata.

8. Corydalis Govaniana.

MR. WILLIAM GRIFFIN'S MODE OF CULTIVATING THE PINE-APPLE.

With respect to the most appropriate soil, Mr. Griffin, very justly it would appear, laughs at those who prescribe many different strange ingredients for compost; adding, that after numerous experiments made with mixtures of deers', sheeps', pigeons', hens', and rotten stable-dung, with soot, and other manures, various proportions and combinations, with fresh soil of different qualities from pastures and waste lands, I can venture with confidence to recommend the following :—Procure from a pasture, or waste land, a quantity of brown, rich, loamy earth, if of a reddish colour the better, but of a fattish mouldy temperature ; that by squeezing a handful of it together, and opening your hand, it will readily fall apart again : be cautious not to go deeper than you find it of that pliable texture ; likewise procure, if possible, a quantity of deers' dung : if none can be conveniently got, sheeps' dung will do, and a quantity of swines' dung. Let the above three sorts be brought to some convenient place, and laid up in three different heaps ridgeways, for at least six months; and then mix them in the following manner, covering the dung with a little soil before it is mixed ; four wheel-barrows of the above earth; one barrow of sheeps' dung, and two barrows of swines' dung. This composition, he adds, if carefully and properly prepared, will answer every purpose for the growth of pine plants of every age and kind. It is necessary that it should remain a year before applied to use, that it may receive the advantages of the summer's sun and winter's frost; and it need not be screened or sifted before using; but only well broken with the hands and spade, as, when finely sifted, it becomes too compact for the roots of the plants."

In rearing the young plants, he generally plants the crowns in the bark till they have struck root; but the suckers he pots at once, unless they are small and green at bottom, when he treats them like the crowns. The pots he uses for both crowns and suckers are five inches diameter, and four inches deep, unless the suckers are very strong, when he puts them in pots seven and a half inches deep. The plants are shifted in the March following into pots nine inches in diameter, by eight inches deep, turning each singly out of its present pot, with a ball of earth around its roots, unless any appear unhealthy or any ways defective, when it is eligible to shake the earth from the roots, and trim off all the parts that appear not alive. He plunges them in the bark (refreshed as at each shifting) eighteen inches from plant to plant in the row, and twenty inches distant row from row.

Mr. Griffin shifts for the last time in the October of the year preceding them in which the fruit is expected; the pots he uses are twelve inches in diameter, and ten inches deep. He plunges them in the bark-bed, about twenty inches plant from plant, and two feet distance from row to row. He says, " place the first row eighteen inches from the kirb, angling them in the rows as you go on."

It is of some consequence to remark, that Griffin's practice in not divesting the plants at any one shifting of their balls of earth, differs from that of Speechly, Nicol, and most other practitioners, excepting Baldwin. It appears highly probable, that by not disturbing the balls of healthy plants, they will produce their fruit both earlier and of a larger size ; for the cutting off the roots must produce a check in the growth of the plant, and their renewal must occupy its chief energies for some time, and thus lessen the vigour of the leaves; since the leaves and roots of all plants assist each other alternately as occasion requires.

Those who advocate the practice of shaking off the balls of earth, and cutting off the roots of pines in the second year's spring shifting, say, that though, at first sight, it has an unnatural appearance, yet, on more minute inquiry, it will be found congenial to nature. In the first place, they say that they only cut away the lower decaying roots, and preserve all the others, unless they are bruised by the shaking off the ball; or injured by disease or otherwise. In the next place, they state, that on attentively examining the pine-plant, it will be found, that, in its mode of rooting, it may be classed with the strawberry, vine, and crowfoot, which throw out fresh roots every year, in part among, but chiefly above, the old ones. This done, the old ones become torpid and decay, and to cut them clear away, if it could be done in all plants of this habit, would, it is said, be assisting nature, and contribute to the growth of the new roots, though it will ultimately increase the vigour of the herb and fruit, will retard their progress to maturity.

Speechly has the following judicious observations in allusion to those who recommend always shifting with the balls entire.

" It is observable, that the pine-plant begins to make its roots at the very bottom of the stem, and as the plant increases in size, fresh roots are produced from the stem, still higher and higher; and the bottom roots die in proportion : so that, if a plant in the greatest vigour be turned out of its pot as soon as the fruit is cut, there will be found at the bottom a part of the stem, several inches in length, naked, destitute of roots, and smooth : now, according to the above method, the whole of the roots decay and

turn mouldy, to the great detriment of those afterwards produced."

The first ball, which remains with the plant full two years, by length will become hard, cloddy, and exhausted of its nourishment, and must, therefore, prevent the roots afterwards produced from growing with that freedom and vigour which they would do in fresher and better mould.

The old ball continually remaining after the frequent shiftings, it will be too large when put into the fruiting pot to admit of a sufficient quantity of fresh mould to support the plant till its fruit becomes ripe, which is generally a whole year from the last time of shifting.

In giving air and water, Mr. Griffin differs nothing from Nicol; he waters moderately in winter, and more liberally in the growing seasons, from March till October; want of water to keep the plants moist, he considers one of the reasons of their showing fruit prematurely. He never waters over the leaves in any stage, nor gives much at the roots in damp weather.

With respect to temperature, this author differs from most others who have written on the pine, but not from many very successful practitioners. He recommends 60 degrees as the heat proper for the pine in every stage, not exceeding five or six degrees over or under. The bottom heat, which he considers proper, is from 90 to 100 degrees.

After many trials and experiments, he found the following the most effectual wash for destroying insects on pines.

To one gallon of soft rain water, add eight ounces of soft green soap, one ounce of tobacco, and three table spoonfuls of turpentine; stir and mix them well together in a watering pot, and let them stand for a day or two. When you are going to use this mixture, stir and mix it well again, then strain it through a thin cloth. If the fruit only is infected, dash the mixture over the crown and fruit, with a squirt, untill all is fairly wet; and what runs down the stem of the fruit will kill all the insects that are amongst the bottom of the leaves. When young plants are infested, take them out of their pots, and shaking all the earth from their roots, (tying the leaves of the largest plants together,) and plunge them into the above mixture, keeping every part covered for the space of five minutes; then take them out, and set them down in a clean place, with their tops declining downwards, for the mixture to drain out of their centre. When the plants are dry, put them into smaller pots than before, and plunge them into the bark bed.

Mr. Griffin's object seems to have been to produce large fruit in the proper season. When gardener to J. C. Gerardot, Esq., at Kelham, near Nottingham, he cut twenty green pines, which weighed together, 87 pounds seven ounces. In July, one of the New Providence kind, weighing seven pounds two ounces. In August, one of the same kind, weighing nine pounds three ounces. And at another time he cut 22 green pines, which weighed together, 118 pounds three ounces.

ON ENGLISH LANDSCAPE GARDENING.

BY WASHINGTON IRVING, ESQ.

The taste of the English in the cultivation of land, and in what is called landscape gardening is unrivalled. They have studied nature intently, and discover an exquisite sense of her beautiful forms and harmonious combinations. Those charms, which in other countries she lavishes in wild solitudes, are here assembled round the haunts of domestic life. They seem to have caught her coy and furtive graces, and spread them, like witchery, about their rural abodes,

Nothing can be more imposing than the magnificence of English park scenery: vast lawns that extend like sheets of vivid green, with here and there clumps of gigantic trees, heaping up rich piles of foliage. The solemn pomp of groves and woodland glades, with the deer trooping in silent herds across them; the hare, bounding away to the covert; or the pheasant, suddenly bursting upon the wing. The brook, taught to wind in the most natural meanderings, or expand into a glassy lake—the sequestered pool, reflecting the quivering trees, with the yellow leaf sleeping on its bosom, and the trout roaming fearlessly about its limpid waters: while some rustic temple, or sylvan statue, grown green and dank with age, gives an air of classic sanctity to the seclusion.

These are but a few of the features of park scenery; but what most delights me, is the creative talent with which the English decorate the unostentatious abodes of middle life. The rudest habitation, the most unpromising and scanty portion of land, in the hands of an Englishman of taste, becomes a little paradise. With a nicely discriminating eye, he seizes at once upon its capabilities, and pictures in his mind the future landscape. The sterile spot grows into loveliness under his hand, and yet the operations of art which produce the effect are scarcely to be perceived. The cherishing and training of some trees; the cautious pruning of others; the nice distribution of flowers and plants of tender and graceful foliage; the introduction of a green slope of velvet turf; the partial opening to a peep of blue distance, or silver gleam of water;—all these are managed with a delicate tact, a pervading, yet

quiet assiduity, like the magic touchings with which a painter finishes up a favourite picture.

The residence of people of fortune and refinement in the country has diffused a degree of taste and elegance in rural economy that descends to the lowest class. The very labourer, with his thatched cottage and narrow slip of ground, attends to their embellishment. The trim hedge, the grass plat before the door, the little flower bed, bordered with snug box, the woodbines trained up against the wall, and hanging its blossoms about the lattice; the pot of flowers in the window, the holly providently planted about the house, to cheat winter of its dreariness, and throw in a semblance of green summer to cheer the fire-side. All these bespeak the influence of taste, flowing down from high sources, and pervading the lowest levels of the public mind. If ever love, as poet sings, delights to visit a cottage, it must be the cottage of an English peasant.

ON ROTTED DUNG AS A MANURE*

It is certainly an erroneous assumption to say, the first stage of fermentation in dung, must necessarily throw off its valuable parts. Every dung-hill of fresh dung throws off a gaseous exhalation, a very short time after it is put together, and the quantity thus thrown off, is regulated by the state of the atmosphere. But this exhalation does not consist of the valuable gases; it is a mere evaporation of the water contained in the dung. The same hot haze may be seen flickering over a fallow field on a sunny day in summer. Nobody could with truth assert, that this haze arises from the disengagement of the gases in the dung, which had previously been inserted into the soil, when it is clearly nothing more than the evaporation of the moisture in the soil. In Saxony, hay is made by heaping together the cut grass, fermenting it for a short time, and afterwards drying it in the sun: but in this process, nobody would say that the nutritious portions of the grass are dissipated, when it is only the superabundant aqueous portions of the grass which are driven off by heat. To say, therefore, the first stage of decomposition in a dung-hill throws of "the most valuable, and the most efficient" parts of the dung, is just to say the vapour of water is the most valuable part of dung.

It is true, were the fermentation continued after all the water in the dung was evaporated, a considerable increase of temperature would ensue; and when the texture of the fibrous portions of the manure began to decompose, there would be an evolution of valuable gases. Direct experiment has proved the escape of gases from a heap of dung which has been long fermenting. But what harm accrues to the dung as a manure, from the escape of these gases? None whatever. We are told these gases constitute the food of plants, and if they are permitted to be dissipated by decomposition, the quantity of nourishment in the heap of manure, will of course, be so much diminished; that if the bulk of the dung-heap be diminished one half, or one third, by excessive fermentation, the quantity of nourishment to the crops will be diminished in a greater ratio. These cautions have long been whispered to the ears of practical men, but they have listened to the advice with a provoking indifference. Like ducklings, when they first take the water, they have continued to disregard every remonstrance of their foster brethren against injurious practices, raising and devouring their food, and enjoying themselves with the greatest complacency in their vocation. It is true, and we must admit it, that some of the gases constitute the food of plants, but it does not follow that plants would receive them as food, directly as they are disengaged from a fermenting and heated mass; nay, it is probable they would rather reject the food that would injure them. But, as plants are not endowed with locomotive powers, they cannot avoid the food which is directly presented to them; they will therefore be obliged to partake of it even in an injurious state, and in thus taking it they die. Accordingly, we invariably find that plants suffer from the contact of fermenting dung, and it is this well-known fact, more than from any other circumstance, which deters farmers from applying dung in an unprepared state. It is sometimes applied to the soil, it is true, in an unprepared state, but long before the crop is brought into contact with it, and after it has undergone fermentation in the soil. Though this application of dung is recommended by men of science, it is performed from the very opposite principle which they recommend. They recommend it, because the gases arising while the dung is fermenting, are absorbed by the soil, and are then given out for the use of plants; on the other hand farmers perform it, because the fermentation will have ceased before the crop is inserted into the ground. Which of these is the more rational reason? The practical one undoubtedly; for it is surely impossible that the slight covering of earth upon the dung can prevent the escape of the elastic gas, however it may retard fermentation.

We may conclude from analogy, that plants like animals, have a mode of consuming their food peculiar to themselves. They may not necessarily consume the food in the state we choose to prepare it for them. All they require is, that the material which supply their food shall be placed in the soil in the

* Quarterly Journal of Agriculture.

state least injurious to them, and within their reach, and will feed themselves. Now, what is the least injurious state in which dung can be presented to any crop? Experience has always said in a "soft cohesive mass." Recent discoveries show that practice has always spoken in accordance with science. Consequently, this concurrence of science is a tardy justification of practice.

The history of the recent discoveries alluded to, which shew the scientific accuracy of practice in applying dung in a rotten state is this. In 1802, the celebrated chemist and analyst, Klaproth, received from Palermo, a substance which exuded spontaneously from the bark of a species of elm. To this substance, Dr. Thomson gave the temporary name of *ulmin*. It dissolves speedily in a small quantity of water, in which respect it is like a gum: but, when the solution is very much concentrated by evaporation, it is not the least mucilaginous or ropy, nor does it answer as a paste. In this respect, *ulmin* differs very essentially from gum. When a few drops of nitric or oxymuriatic acid are added to the solution, it becomes gelatinous, which, when slowly evaporated to dryness, and treated with alcohol, and again evaporated, leaves a light brown, bitter and sharp resinous substance. Thus, it appears that *ulmin*, by the addition of a little oxygen, is converted into a resinous substance. In this new state, it is *insoluble* in water. This property is very singular: that a substance soluble in water should assume the resinous form with such facility is very remarkable. Berzelius has found this curious substance in all barks; Bruconnot, in saw dust, starch, and sugar. But, what is more to our present purpose, Sprengal and Polydone Boullay have found it to constitute a leading principle in all soils and manures. Sprengel appropriately calls it *Humin*, from its existence in all soils: *ulmin* being given to it by Dr. Thomson several years ago as a temporary name.

Such is the history of this remarkable substance, which performs so important a function in the action of putrescent manures, and which is found in abundance in "the soft cohesive mass" of rotten dung. Let us see how it operates in manures.

The chief food of plants consists of the carbonic acid gas and humic acid mixed with water. Every manure is therefore only valuable which contains these substances in the greatest degree, and in such a state as they are most easily available to plants. Now, practice recommends the rotting of every kind of dung, whether simple or compounded, and the reducing it into a uniform dark brown "soft cohesive mass," similar in consistence to fresh peat, so that it may be cut with the spade, because it maintains that dung in this state is much more valuable to crops than fresh dung or mere litter, whatever may have been the quantity of carbonic acid gas which had evolved during its fermentation. Recent discoveries have proved the wisdom of this recommendation of practice, because they have proved that rotted dung contains much more carbonic acid gas and humic acid, weight for weight, than fresh dung. There is, it is true, a loss of bulk in rotting fresh dung, and of an evolution of carbonic acid gas during its fermentation; but the question is not what the volume of carbonic acid gas alone is in dung, but what is the most available state in which the carbonic acid gas in the dung can be presented to plants; and this is the rotted state, because in that state alone, it contains the humic acid in quantity. All the black carbonaceous matter in dung-hills is the humin ready to be converted into humic acid, which is in fact the cooked state of the food of plants. Moreover, practice finds that fresh dung is injurious to vegetation, and recent discoveries now inform us that this arises from the acridity of the ammonia, which is always present in unfermented dung. Fermentation drives off the acrid ammonia. Fresh dung is found to injure plants by *burning* them, which is a very appropriate term to describe the action of ammonia. In like manner, stale liquid is not so good a top-dressing to grass as fresh, or when it is largely mixed with water; because science now informs us, that ammonia becomes concentrated in stale liquid manure, and is, therefore, in an injurious state from plants, and that it is necessary to mix liquid manure largely with water, in order to dilute the ammonia, and allow the proper action of the humid acid, which exist in large quantity in them. Again, it is not an uncommon practice to cover a dung-hill with earth in hot weather, and this is now explained, not as it hitherto has been, that the earth absorbs and prevents the escape of the carbonic acid gas, which it could no more do than a balloon made of gauze could prevent the escape of hydrogen gas; but that a violent fermentation in the dung is checked by the earth partly excluding the atmospheric air and rain water, the oxygen in either of which is indispensable to continue the process, it being this oxygen which forms the carbonic acid gas by uniting with the carbon of the dung. The necessity of checking a *violent* fermentation in a dung-hill which contains a large portion of horse dung, is to prevent it being what is technically called "*fyrefanget*," a state of dung which is useless.

In regard to composts, it is found that to mix lime with fresh or rotten dung is to waste it, because, as is now explained, the lime takes up and renders useless the carbonic acid gas which they contain. In like manner, a compost of fresh dung and weeds, green leaves, grass, turf, and green vegetables, without lime, is valuable, because all these substances supply abundance of *humin*. On the other hand, lime promotes the fermentation of peat earth, dry leaves, and every thing which contains hard woody fibre, and supplies humin in quantity.

It is requisite to attend to the seasons of manuring.

Dung, in any state, is never applied to the land in winter; it is best applied in spring: it is injudicious to expose it to a hot sun in heaps; and it is improper to allow it to remain a length of time in heaps on the field. These practices are now easily explained, and are quite in accordance with science. In winter there are no crops in the field to which the dung can be applied: in spring, on the other hand, plants and seeds are ready to shoot forth into life; their roots are then most active to devour the nourishment which may be placed within their reach. To spread out rotted dung in hot weather and let it lie, must be to subject its component parts to the highest degree of evaporation, and to allow it to remain in large heaps for a time on the ground, is to give the portions of the ground which are covered by the heaps an undue advantage.

We thus see that science now agrees with that practice which has been pursued for years with unexampled success. It is consolatory to practitioners to think that their experience, though unknowingly to them, has guided them to success on really scientific principles. This agreement of experience and science should teach every one that science *and experience*, and not science alone, ought to be made the tests to try the accuracy of opinions. Unfortunately for the credit of science, the test of accuracy hitherto, in the application of putrescent manure, has not been submitted to practice. It is always for the interest of practice, however, to listen attentively to the suggestions of science. One of these suggestions as a rule to try the value of all sorts of manures, is, that they shall be judged by the proportion of carbonic acid gas and humic acid they contain or may evolve after they have been applied, and also by the quantity of water which they are able to take up and retain. The rule, when confined to carbonic acid gas and water, was supposed to lead to a correct view of the subject, independently of ascertaining the proportion of humic acid. But when the rule was confined to these substances before the discovery of the importance of the humic acid, we see the errors which even men of science fell into. Knowing now the effects of the important principle of humic acid, it ought to be strictly retained as a term in the rule; because, were the ability to retain water alone taken as a test, bog earth, the most sterile substance in an undecomposed state, might be decided to be the best of all manures; and were the evolution of carbonic acid gas alone taken as a test, chalk should be an excellent manure, and so it would always be, could it be brought to take up and retain enough of water to dissolve a portion of it, which it can do by means of the humic acid. Now, let us apply these texts to rotten dung. There can be no question that rotten dung is very much superior in imbibing and retaining water, to what is fresh, unfermented, or beginning to ferment. A simple experiment can easily prove this to those who doubt the fact. "With respect to carbonic acid gas, humic acid, and the minor materials of the food of plants," says a recent author, "there can be as little doubt of the superiority of rotten dung, which is, in fact, in a state very nearly approaching to the best leaf mould or virgin loam, and though a weighed quantity of fresh dung certainly will yield more carbonic acid gas than when this same quantity is allowed to ferment and rot, in consequence of much of it being given off during these processes, yet the weighed quantity of fresh dung will bear no comparison in this respect with rotted dung. The quantity of humic acid is very considerably greater in rotted dung. Hence, in treating in future of all putrescent manures, the very important effects of the humic acid must never be overlooked."

ON CONVERTING A LEY FIELD INTO A KITCHEN GARDEN.

BY MARTIN DOYLE, OF BALLYORLEY.*

In the late editions of my "Hints to Small Farmers" there is a brief detail of the Rev. Richard Radcliff's modes of sod banking, which, as it may be new to many readers of this Magazine, I shall now beg leave to restate:

"We lightly ploughed half an acre of old grass land, and employed boys and girls to collect the sods into banks, twenty yards asunder, by which the expense of car work was saved When this was done, the spaces between those banks were ploughed, and drills being formed, he gave the usual allowance of manure, and planted potatoes in them; then that the banks (which were twelve feet in breadth, and two feet and a half in depth) might not be unproductive, he had them also planted with potatoes in the Munster f. shion, taking care to cover them sufficiently from furrows at each side of the bank."—"The general advantages to be obtained from this plan, Mr. Radcliff states to be (and, in his opinion, he is strongly supported by the flattering approbation of the veteran agriculturist, Sir John Sinclair) the collecting on the spot a great quantity of the choicest manure, producing valuable crops; while it is rotting, the clearing of the land from weeds, the saving of a ploughing to one sixth part of itself, and the bringing into action a body of fresh earth, enriched by manures washed into it during the preceding years."

The following circumstances have subsequently led me to perceive the particular excellence of this process, as applied to a garden:

One of my daughters, about two years and a half

* From the Irish Farmer's and Gardener's Mag.

ago, married a person of my own line of life, but more of a grazier than a general agriculturist, such as I am pretty well known to be. On going to the house of her husband, she found that he, like many men of his class, neither knew nor cared much about a garden. His small patch of parsnips and cabbages—the only vegetables which he cultivated—were usually sown and planted in the corner of his haggard, or in the headland of a potatoe field. Kitty (my daughter) was exceedingly disgruntled at this obvious deficiency; and having inherited from Mrs. Doyle and me, a fondness for the pleasures and comforts of a garden, determined with her husband's acquiescence, to form one, and I was, as a matter of course, consulted.

Their house stands at one end of a well enclosed field, about an acre in extent—at that time (March 1831) covered with a rank grassy sod. Mr. Kelly, my son-in-law, proposed the immediate breaking up of this luxuriant ley for lazy bed potatoes, as a good preparation for a kitchen garden; but his plan necessarily required twelve months for actual effect; and, therefore, was unealculated to satisfy Kitty's impatience. My advice to proceed immediately on Mr. Radcliff's plan, as given in my "Hints," was received, and instantly acted on. The various and successive operations of ploughing, gathering, and banking, were soon executed; and never, I believe, with better result. I shall state the minute particulars. After the abstraction of the vegetable surface, the soil proved to be, in many places, especially near the house, fourteen inches in depth, and not less than nine inches, except in one portion about half a rood) where the extreme shallowness of earth made me regret the spoilation of its upper covering. The banks (powdered lime having been scattered through them in the course of their formation) were well planted with potatoes, put in, according to the Munster fashion, with the back of the spade, and the intervals well manured and well dug, occupied with cabbages, cauliflowers, parsnips, carrots, artichokes, lettuces, &c. &e., which succeeded perfectly, affording much more than an adequate supply for the master and mistress. As may be supposed, the potatoes in the banks were most luxuri nt, probably at the rate of two hundred barrels per acre.

But it was in the succeeding year that the superiority of this mode of management became remarkable. The banks after two or three perfect diggings, and exposure to the winter's frost, became, with an application of a moderate quantity of rotten dung, critically suited to the asparagus and sea kale plants, which soon took root and flourished. Portions of the banks were thus appropriated, and the remaining parts of them, under similar treatment, were occupied by carrots, parsnips, mangel wurzel, white beet, and magnificent celery. The intervals, as in the former years, were filled with cabbages, cauliflowers, turnips, brocoli, and artichokes. In short, a greater proportion of vegetables (except in the particular spot already noticed for its shallowness of earth) never grew on the same space of ground, and there the crops were undoubtedly bad. But a whim of Kitty's led to the remedy of this deficiency; she took it into her head (and very properly) to have an Italianated grass garden, on a small scale, for flowering shrubs and showy flowers, and this ornamental ground she desired to have near the parlour windows in the said field, and on the very spot where her husband's calves used to caper, and his dirty noisy geese used to waddle. To gratify her longings, my son-in-law fist rolled away (I mean by deputy) in wheelbarrows, from each of the four parallel banks, (which met the house at right angles) about twenty yards of their component matter, leaving at the bottom of each merely enough of stuff to form half a dozen fancifully shaped beds, for the reception of shrubs, so arranged as to conceal, in a very few years, the kitchen garden beyond. The rich compost of rotten sods removed to the poor patch, was laid on very thickly, at least six inches in depth, and has, consequently, rendered that spot most productive.

A neighbouring market will always afford a ready and profitable channel for the sale of the vegetables, which this family cannot consume.

The portions of the banks which are not permanently devoted to the production of asparagus and sea kale will be gradually transferred, as occasion may require, to the intervals, rendering them also extremely rich, and productive of the more valuable kinds of kitchen vegetables, onions, cauliflowers, &c., with appropriate diversions for fruit trees. The soil in the parts of the ornamental patch, which has been covered with thin mountain turf, was previously shovelled off evenly, and added to the earth which forms the beds for the flowers and shrubs, so there is no particles wasted.

I cannot imagine a better mode of forming a new garden, under similar circumstances, and I strongly recommend its adoption, especially in the neighbourhood of cities, where seedsmen and gardners have frequently occasion to transmute turf (ley) into garden and nursery soil.

CATECHISM OF GARDENING.

BY MR. MAIN.

In the British Farmer's Magazine, Mr. Main, of Chelsea, well known to our readers as a practical man of extensive and sound experience, has commenced to give in detached portions a catechism of gardening, which we are given to understand is to be published separately, as soon as completed. If this intention is carried out, we hope for the sake both of the author and of the public, that all the questions will be cancelled; for amongst all the catechisms which we have ever seen constructed for the avowed purpose of simplification, this is decidedly the greatest failure. It does not simplify one jot, while the questions lumber the page, increase the expense of printing, and, worse than all, they ever and anon break up the continuity of the author's excellent practical statements as much as Uncle Toby's Lillebullero would do an anthem of Handel's, and as offensively to our taste as a drain from a dunghill would be if carried right through a parterre of flowers. We therefore advise the author, if he have any wish for the success of his little work when published separately, to recast the whole, and leave out every one of the bungling questions, when it will, from its high practical character, be quite certain to sell largely. That our readers may see we have given a just opinion of the merits of the production, every way creditable to Mr. Main, except in the stumbling blocks above said, we shall give his fourth chapter entire.

On "The Cultivation of Leaves and Leaf-stalks."

Q. You have now to enumerate and describe the leaves and leaf-stalks used as food: what are they?

A. All the cabbage tribe, lettuce, endive, spinach, white-beet, celery, cardoon, rhubarb, lambs lettuce, sorrel, parsley, mustard, cress, and watercress.

Q. What concerning the cabbage?

A. The principal and most useful varieties are, the early York and early dwarf, for first crops; Battersea and sugarloaf for latter supplies; the small red for pickling; and the drumhead and large red for field culture. The early Battersea is an excellent sort for cottagers.

Q. At what seasons should cabbage be sowed?

A. For the principal spring crop the seed should be sowed sometime between the 25th of July and 8th of August. If sowed before that time, many of the plants run to seed without heading; and if later, they do not come in soon enough for the table.

Q. Is not cabbage seed sowed at other times?

A. Yes: as a succession should be constantly coming in all the summer, another seed-bed is sowed in September, and again in April and June, from which sowings young plants may be had to keep a supply the year round.

Q. How are the seed beds made?

A. An open spot or border is chosen, well manured and digged; the seed is scattered regularly, firmly trodden in and raked smooth. As the seedlings rise they must be guarded from birds, and kept free from weeds.

Q. Is it necessary to transplant the seedlings to a nursery bed?

A. As it is an advantage to have plants of what is called a stocky, *i. e.* a stout, low habit, it is good management to prick out all the strongest into a fresh bed, not only that they may have ample room to spread their leaves, but because the underlings in the seed bed will be greatly benefited by their removal.

Q. How is this part of the business done?

A. There are two modes practised. The first is to prepare a bed thrice the size of the seed-bed; on this the largest of the seedlings are carefully dibbed, four or five inches apart; here they stand to gain strength till they are finally planted out in October.

Q. What is the other method?

A. The ground (or part of it) intended for the principal crop of cabbage is got ready soon as the seedlings are fit to prick out. Here they are placed in rows twice as thick as they should ultimately stand—say in rows ten inches asunder, and the plants seven inches apart in the rows. About the 5th of October, all the ground being prepared for the reception of the supernumeraries, each intermediate row, and each intermediate plant in the standing rows, are transferred to their proper places on the vacant ground, to complete the plantatiou.

Q. Is there any other way of raising cabbage?

A. Yes. Some curious persons sow the seed thinly in drills, and, when the plants are fairly up, thin them to five inch distances; by which treatment they grow strongly, and are in excellent condition to be finally set out in October; but this is a refinement in the cultivation which is not absolutely necessary.

Q. What is the general management and its effects on a plantation of cabbage?

A. The bulk, as well as the quality of the crop varies with the character of the soil. In light, sandy, and moderately rich ground, cabbage are earlier, and sweeter in flavour, though yielding smaller heads; of course, in very rich land (and all the tribe require rich land) the crop is somewhat later and correspondingly larger. But in any ground, in good heart, if well digged and prepared, a crop sel-

dom fails if the plants are hoed among and properly earthed up.

Q. What are the usual distances at which cabbage are planted?

A. The smaller early sorts may be planted in rows eighteen inches asunder, and twelve inches apart in the row; the larger sorts should have two feet intervals between the rows, and eighteen inches distances from plant to plant. The planting may be done as the digging proceeds, which saves breaking the ground; or first digged and planted afterwards.

Q. What precautions are necessary in transplanting cabbages?

A. That the plants may be carefully taken up; long straggling roots may be shortened; and should the maggot have seized the root or stem, the tubercles must be paired off. In dibbing or planting with the trowel, the plants should be let in up to their lower leaves, and made perfectly firm in their new place. If the ground or weather be dry, give each a little water.

Q. What is the maggot you mention?

A. It is a fly, or beetle, which deposits her eggs within the cuticle of the lower part of the stem, causing deformities called "clubbing" by gardeners, and "fingers and toes" by farmers.

Q. Is there any preventive against this insect?

A. It is found that soap-boilers waste is useful; and probably, were the seed beds occasionally watered with soap-suds, the parent fly might be deterred laying her eggs on the plants. Some gardeners make a puddle of earth, soot, and lime, with which the roots are smeared before planting, but this not always effectual.

Q. When are the autumn planted cabbages fit for use?

A. Generally about the beginning of May following. The forwardest are tied up like lettuce, which serves to whiten the heart. If the plants be true in kind, and have had equal treatment, many come in together; in which case, a good plan in using them is not to cut one here and there, but to begin at one side, taking row after row, till the whole is used. The advantage of this, in a little garden, is, that as soon as one row is cleared, the ground may be immediately re-cropped.

Q. And how is the summer supply continued?

A. By a succession crop from the seed bed sowed in September, and again from those sowed in April; from the last of which plants may be had to serve till winter.

Q. Are any later sowings made?

A. Yes. A seed bed is sowed in June, to raise what are called coleworts, or open cabbage, during autumn and winter.

Q. Are red cabbages sowed and cultivated in the same way?

A. Yes: nearly so. Sow in August for the summer supply: and again at the end of March for winter service. Red cabbage require more room than other sorts, and do best in single rows; as in the alleys of other low crops. Though seldom used in cottages, the cottager should always have a few, as they meet ready sale in market towns.

Q. What are those greens, of which so many are sold in the London market, called plants?

A. Young cabbage, or coleworts, sowed and planted out at any time of the year, and pulled for sale just before or after they begin to form heads. If quickly growed, they are preferred to headed cabbage, being more mild in flavour.

Q. Which is the next variety of this tribe deserving notice?

A. The savoy: as being hardy and useful, particularly in winter; indeed, it is said they are improved by frost. For a principal crop, the seed should be sowed about the middle of April. Defend the seedlings from birds; and prick them out into nursery beds, if there be time and opportunity. At the beginning of July they may be transplanted out for good, on well digged or trenched rich ground, in rows two feet apart, the plants being dibbed at sixteen-inch distances in the row.

Q. Are there different varieties of the savoy?

A. There are three—the green, the dwarf, and the large yellow; the first is the most delicate, but the last is preferred for the main crop.

Q. What is borecole?

A. A subvariety of the cabbage, commonly called Scotch kail, of which there are several kinds, as the tall and dwarf green, the brown, the Jerusalem, the Buda, &c. All are hardy, and well worth a place in every garden; not so much for the principal heads as for the great number of sprouts which rise in succession from the stem. Woburn kail is a distinct variety, being a perennial, and propagated by cuttings from the old stool planted in spring.

Q. What are Brussel sprouts?

A. A sub-variety of the Savoy; the head is inconsiderable; but from the stem come forth a vast number of little compact heads of excellent quality, and for which the plant is chiefly cultivated. This, and all the sorts of kail are raised from seed, sowed about the 20th of April, and transplanted into good rich soil, and afterwards managed like cabbage.

Q. What have you to state relative to lettuce?

A. It is one of our principal sallad herbs: pleasant, sanative, and easy of culture. As lettuce soon runs to seed; it requires to be frequently sowed in the summer months. For the earliest spring supply, seed beds are sowed in August; whence a part of the plants may be removed in October into frames, or to some warm dry situation, where they may be sheltered from the north and east winds, and be occasionally covered with mats, dry fern, or branches of evergreen trees during severe frost.

Q. Do you call these the principal crop?

A. No. The principal crop for summer use, is sowed as early in the year as the weather will permit, or in frames under glass, from whence they are planted out for good, when the leaves are about three inches long, and the mild spring weather allows the tender plants to be set abroad. The rows should be twelve inches asunder, and the plants about nine inches apart in the rows.

Q. What is further to be observed in growing lettuce?

A. That they are planted on very rich ground, which should be frequently hoed, and when the plants have nearly attained full size, the forwardest should be tied up to assist the whitening the heart. Sometimes this crop is sowed thinly in shallow drills; the supernumeraries are drawn for transplanting, which prolongs the supply from one sowing.

Q. Is it not usual to sow lettuce with other crops?

A. Yes; both the coss and cabbage are sowed with spinach, in August, and the former among onions in March. Those sowed among spinach are intended for transplantation if they survive the winter, and those raised among onions, are drawn for use as soon as fit, or when they damage the onions.

Q. How many sorts of lettuce are cultivated?

A. About twenty varieties; but the hardy white, hardy green, green and Egyptian coss kinds, are the best for common use, The brown Dutch, common white, and grand admirable cabbage sorts, are preferred for kitchen use. All are used as salad herbs in every stage of their growth; but the larger and whiter hearted the coss varieties are, the more they are prized.

Q. Is not endive allied to lettuce?

A. No; notwithstanding their properties and uses are alike. Endive is less crisp, and more bitter than lettuce; but it is capable of being beautifully blanched, and thereby becomes palatable; it is also more hardy than lettuce, and therefore, is chiefly used in the winter months.

Q. When should endive be sowed?

A. If sowed early in the year, the plants soon run to seed. The middle of the months of June, July, August, and September, are the proper seasons for sowing, in order to have a full supply through the autumn, winter, and spring. Whether the plants remain in the seed bed, or are transplanted in rows into fresh beds, they require at least, twelve-inch spaces, as the leaves spread widely and close to the ground.

Q. How is it blanched?

A. By tying the leaves together like lettuce, or by earthing up the full grown plants with dry soil, or by placing them during the month of October in raised beds of dry sand, the leaves gathered up and laid close together, to be guarded against rain and frost by mats or frames, or they may be stored in sheds. As sallad herbs form no part of the cottager's fare during winter, endive is of little value in his garden. There are four varieties of this plant; the white curled and the white Batavian being the most desirable.

Q. What is the use and culture of spinach?

A. The leaves are a delicate green, and much used in superior cookery. Where a constant supply is wanted, the round-leaved variety is sowed on large beds broad cast or in drills, monthly from January until August. The seed is well trodden before the ground is raked. When the seedlings are an inch or two high, they should be hoed to five inch distances, and kept always free from weeds.

Q. Is there not another variety?

A. Yes, the prickly seeded of which the principal and largest sowing is made about the 10th of August. This yields the winter and spring supply, the leaves being repeatedly picked or cut from the plants. Even to the cottager, a bed of spinach may be profitable, as it is a pleasant addition to the rasher when turnip-tops are scarce, or before the cabbage comes in.

Q. Are there any other spinacious plants?

A. Yes, there are two; viz., the New Zealand spinach and the white beet. The first is only cultivated in gentlemen's gardens, and managed much as ridged cucumbers are; though if sowed in May, in the open ground, and allowed to ripen and shed its seed, which it will do in autumn, plants will come up plentifully in the following summer. The second is a substitute for spinach when nothing better can be had. Ten or twelve good seeds of the white beet, dropped in a drill, on well manured ground, are sufficient for a small garden.

ON NEW ZEALAND FLAX.*

This highly useful plant is one of the many important discoveries for which we are indebted to the late Sir Joseph Banks, who says, in Cook's First Voyage, when speaking of the productions of New Zealand,

"But among all the trees, shrubs, and plants of this country, there is not one that produces fruit except a berry which has neither sweetness or flavour, and which none but the boys took pains to gather, should be honoured with that appellation. There is, however a plant, that serves the inhabitants instead of hemp and flax, which excels all that are put to the

* From Curtis's Botanical Magazine.

same purpose in other countries. Of this plant there are two sorts; the leaves resemble those of flags, but the flowers are smaller, and their clusters more numerous; in one kind they are yellow, and in the other, a deep red. From the leaves of these plants, with very little preparation, the natives make all their common apparel, and they also manufacture their strings, lines, and cordage for every purpose, which are so much stronger than any thing we can make with hemp, that they will not bear a comparison. From the same plant, by another process, they draw long slender fibres, which shine like silk, and are as white as snow: of these, which are also suprisingly strong, the finest cloths are composed; while of the leaves, without any other preparation than splitting them into proper breadths and tying the strips together, they make their fishing nets, some of which are of an enormous size. A plant, which, with such advantages might be applied to so many useful and important purposes, would certainly be a great acquisition to England, where it would probably thrive with very little trouble, as it seems to be hardy, and to affect no particular soil, being found equally in hill and valley, in the driest mould and in the deepest bogs. The bog, however it seems rather to prefer, as near such places we found it to be larger than elsewhere."

The seeds brought home by Sir Joseph Banks in 1771 did not succeed, but the New Zealand flax was introduced to the royal gardens at Kew, through the medium of the same enlightened individual, in 1789, and thence has been liberally distributed to collections in our own country and upon the Continent. By Mr. Actors it was sent to the gardens of the Museum of Natural History of Paris in 1800; and in that country it has, as might be expected from the nature of the climate in many of the districts, been cultivated in the open air, and for the first time, it produced flowers in the department of Drome, in 1812, but it bore no fruit. Messrs. Labillardiere, Faujas de St. Fond, Desfontaines, and Freyconet have devoted much attention to the cultivation and to the manufacture of this plant. It has even withstood the severe winters of Paris; but in the south of France it has been propagated with considerable success, and survived the winters without the smallest protection. In the department of the west, particularly in the environs of Cherbourg, it has perfectly succeeded and yielded ripe fruit. It is readily increased too, by dividing the roots. M. Faujas de St. Fond, gives the following mode of dividing the fibre. He dissolves three pounds of soap in a sufficient quantity of water, together with twenty-five pounds weight of the split leaves of the Phormium tied up in bundles; all are then boiled during the space of five hours, until the leaves are deprived of a tenacious gluten, and of the gum resin, but which is not removed by the ordinary process employed in the preparation of hemp: after which they are carefully washed in running water.

From the experiments of M. Labillardiere, the strength of the fibre of this plant, as compared with that of the Agave Americana, flax, hemp, and silk is as follows: the fibre of the agave breaks under a weight of 7; flax, of 11¾; hemp, of 16¾; phormium, 23-7-11ths; and silk of 24. Thus it appears, that of all vegetable fibre, that of phormium is the strongest. It possesses, too, this further advantage over hemp and flax, according to the French authors, that it is of a brilliant whiteness, which gives it a satiny appearance, so that the cloths made of it do not need to be bleached by a tedious process, or through those other means, by which the quality of hemp and flax is much injured.

There scarcely can be a question, seeing that the phormium tenax has succeeded remarkably well in the open air of Invernesshire, Scotland, (apparently in the neighhourhood of the sea,) without any shelter in the winter, and without even the protection of a wall, that the opinion expressed by Sir Joseph Banks, of the suitableness of the English climate to it, is well founded. Indeed, we know that the late ——Yates, Esq. of Salcombe, Devonshire did cultivate this plant upon a rather extensive scale, and made preparations for converting it into thread, which his sudden death prevented him from carrying into effect. The south of Ireland would in all probability be found to be well suited to its growth and increase.

The phormium tenax is indigenous to the islands of New Zealand. On the northernmost of the islands, which has been traversed almost in every direction by Europeans, it is found in greater or less abundance, as well as on the immediate coasts in low situations, subject to be overflowed by the tide, as in the inland county, generally in grounds more or less swampy.

Extensively diffused as this valuable plant is over the surface of the island, it is along the western coast, to the southward of the parallel of 35 degrees, and in Cook's Strait, the greatest quantities have been found, where it is said to grow in fields of inexhaustible extent. The indigenous growth of the phormium is not limited simply to New Zealand, for it was long ago discovered in a wild state at Norfolk Island, where it forms long tufts along the cliffs, within the influence of the salt spray rising from the heavy surfs, which ever and anon lash the iron-bound shores of that small but truly beautiful spot of the Pacific.

The preparation of the flax for their own use, or for exchange with Europeans, is effected by the native women, and their method of separating the silky fibre from the long flag-like leaf of the plant, of which it forms the under surface, appears simple enough. Holding the apex of a recently cut leaf between their toes they make a transverse section through the succulent matter at the end with a shell

(which they still employ though they possess every species of iron-edged tool), and inserting the shell, (said to be of the genus Ostrea) between that substance and the fibre, readily effect its separation, by drawing the shell through the whole length of the leaf. It is to be observed, that the separation is always performed by those people when the vegetable is freshly cut: nor has the attempts of Europeans to extract the filaments from the leaf by maceration, been at all successful: the experiments that have been made at Sidney, showing that ' the large proportion of succulent matters (for so the failure was accounted for) rendered it impossible to effect the separation by decomposition in water, without materially injuring the strength of the fibre.'

Simple as this mode appears of separating the flax from the leaf by a shell in the hands of those savages, still the European has not succeeded in his endeavours to prepare the fibre for himself, either by that, or any other means that have been tried; nor has any instrument or piece of machinery yet been invented to enable him to strip off, and prepare this valuable filament for the English market. The Port Jackson traders must still be dependent on the native women and their shells for the cargoes they obtain.

The flax thus obtained from the natives by the merchants of Sidney, undergoes no heckling, cleaning, or other preparation, previous to its being shipped for the English market: but is merely made into bales, by being put into a press and screwed down. It is manufactured into every species of cordage, except cables, and Mr. Bigge, the Commissioner of Enquiry to New South Wales, observes in his report, pp. 52, 53, that its superiority of strength to the hemp of the Baltic, has been attested, both by experiments made at Sidney, and by one that was effected under his own observation in the King's Yard at Deptford"

I have not heard that canvas has been made of it, but my correspondent (a merchant from Sidney, now in London) informs me, that a person has been trying it in table-cloths, napkins, &c. but with what success he was not aware.

For many years past, has some communications been kept up by individuals residing at Port Jackson, with the natives of New Zealand; but it is only of late that the trade in flax has been found to be a profitable speculation. Of this, the merchants of Hobart's Town and Launceston, in Van Dieman's Land, are now fully aware; and having had their attention turned to its advantages, they are beginning to prosecute it with ardour.

I may here remark, that at the period (years ago) when the trade with this noble race of savages was first opened by persons of courage and enterprise at Port Jackson, axes, knives, and other edged tools, together with beads and similar ornaments, were received by them with avidity; but now they will hardly take any thing in exchange but arms and amunition. With these last named articles the people are not all likely to be satiated: there is no danger of there being a glut of muskets and gunpowder, to stop the trade in flax or Cawdie timber; but the arms must be of a superior, or, at least, of a good quality: for, as Mr. Bushby, in his paper on New Zealand just published, with other authentic information relative to New South Wales, justly observes, (p. 61) ' Houghi, the late chief of the Bay of Islands' tribe, could bring into field five hundred warriors, all of the aristocratic or free class, armed with muskets; and so well are they now acquainted with the qualities of the latter, that a vessel which lately took down two hundred could not dispose of them on any terms, because the locks were only single bridled. The same vessel sold a ton and a half of gunpowder, in exchange for flax, in a few days, and would have had as little difficulty in disposing of the muskets had they been of a better description. Although most of the chiefs can now muster a large force armed with muskets, their avidity to add to their armoury has undergone no diminution; and, with the exception of blankets, red woollen shirts, and other warm clothing, tobacco, and sugar, scarcely any other article of English manufacture or merchandise has, as yet, any attraction for them.

To what extent the trade in flax has increased with these islanders of late, (say, since 1828,) some idea may be formed from the following facts. According to the statistical return of New South Wales, for the year 1828, New Zealand flax to the extent of sixty tons, and valued at 2,600*l.* was exported from Sidney to England, during that year; whilst, during 1830, (according to the returns taken from the Custom-House books,) the quantities stated as the imports of it into Sidney for the English market, were eight hundred and forty one tons; and in 1831, one thousand and sixty-two tons. Its present price in London, my correspondent informs me, may be stated from 15*l.* to 25*l.* per ton, much depending on its quality, and the clean manner in which it is brought into market. Some doubts have been entertained by merchants of this kind of trade with the New Zealanders being likely to continue. In reply to this doubt, my friend observes, that he, among others, considers it doubtful at present: for as the demand for the raw commodity as introduced into the London market, is not considerable, and at the public sales of it there is but little competition; few houses having commenced to manufacture it, it may hardly fetch a remunerating price. But when its character has become more generally known, than it at present is, and its superiority to Baltic hemp more fully ascertained by rope manufacturers in England, the demand for it will increase, and the price improving, will induce Sidney merchants, to hold out to the New Zealand chiefs such novel and

costly temptations, in the way of trade, as would ensure the continuance of their exertions in preparing the flax for them, in which it has been said they have rather relaxed of late, because they are determined to see what new articles of use or ornament we could offer them, that would be worthy of their acceptance, other than muskets and gunpowder.

I will close my remarks on the subject of phormium, and the communication which it, and other indigenous productions of the soil of New Zealand, have brought about, between its half civilized inhabitant and the European, in the words of Mr. Busby, in the page just referred to. "This intercourse (with commercial men) claims the attention of his Majesty's Ministers, from the advantage which could not fail to result from fostering and protecting a trade, that is calculated to open a very considerable demand for British manufactures; and to yield, in return, an article of raw produce, not only valuable to England as a manufacturing country, but indispensable to her greatness as a maritime power, and which the superiority of that power will always enable her to command, independently of foreign countries. And, apart from all motives of interest, it is deserving of attention from the opportunities it affords of civilizing and converting to Christianity, one of the most interesting races of people, which British enterprise has yet discovered in any quarter of the globe!

ADAM, THE GARDENER.

BY C. C. CLARKE,

*Author of "Tales in Prose, from Chaucer."**

An elegant little work, full of pretty writing and interesting information to young gardeners and young botanists, conveyed in the form of narrative and conversation, and arranged under each month of the year, beginning with January. It opens thus

JANUARY.

"Dread *Winter* spreads his latest glooms,
And reigns tremendous o'er the conquer'd year.
How dead the vegetable kingdom lies!
How dumb the tuneful!"

THOMSON.

Adam Stock was the eldest son of a gentleman, who, having retired from London to the southern coast of our island, had there purchased an estate, consisting of a house, a large garden, a field, and a poultry yard. He knew the value of industry, and that, to an independent and contented mind, few things are *really* necessary for our comfort; he, there, determined to cultivate his own ground; and as nearly as he could, to do every thing for himself. This is the true meaning of being *independent*. He bought a cow, and some pigs, chickens, ducks, and geese. Mr. Stock understood the principles of gardening, and possessed great taste and knowledge in the cultivation of flowers, his garden was, therefore, always beautiful to look at, and the more so, because you knew that it was the work of his own hands, and that all you saw, was done with pleasure. This is the reason why a cottagers's garden is a more pleasant sight than a rich man's: for though the rich man's garden may be larger and much more handsome, yet we do not know that he is pleased with it; because it is only his *money* which makes it look beautiful. But when we see a neat and pretty garden belonging to a poor man, we may be sure that that man is contented and happy; and a happy poor man is one of the most charming sights in the world.

"Little Adam loved his father very much, and was fond of being near him whenever he was at work. He had heard his father say, that on the following morning he should rise early to brew some beer for the family: and Adam dressed himself before it was light, and came to call his father, which pleased him very much. So he was allowed to help in the brewing; and, as a reward for his diligence, his father permitted him to stay up all night till the whole process was finished. When Mr. Stock was employed in the garden, little Adam would always be at his side, asking him the names of the different flowers that were in blossom, together with many questions about the way of cultivating them. He showed such delight in the amusement, that his father told him one day, that if he would be a good and obedient boy, he would teach him to be a complete gardener, so that by the time he grew up to be a man, he should be able to do every thing for himself, and know how to direct others. Adam was delighted. 'Well then,' said his father, 'this is now the first month in the year, and to-morrow we will begin. There is at present no snow upon the ground, and the frost has given way. I will buy you to-day a spade, and a rake, and a hoe; and I think you will be set up. One thing only you must promise me;—that you will attend to what I tell you; and endeavour to do every thing in the best way you possibly can.' This you may be sure he promised to do."

Such is the opening, and we shall now dip into

* 12mo. E. Wilson. 1834.

what immediately claims attention in this "merry month of May," whose beauties are thus touched upon by Mr. C. C. Clarke.

"By four o'clock Mr. Stock had roused all the sleepers in his house, singing to them in the words of the motto in this chapter, "Now the bright morning star," &c. "Up! up!" said he, "you slug-abeds! the lark is awake, and the bee is stirring; all but you are preparing to meet the rising sun. The flowers are getting ready to open their dewy buds, and the morning air is blowing softly upon them. Here is May-day come in after the old fasion, cheerfully and bright: so we will *keep* it after the old fashion. Come! up with you! make haste—we shall not begin it properly, if we do not see the sun rise. Get up, you lazy dog! Adam—let me catch you in bed in five minutes time, and I will give you such a cold pig as shall make you remember May morning for some time to come." Who could sleep after being called in this manner? I know but of one; but he has reformed; and, therefore, shall be nameless. In about a quarter of an hour the whole family were dressed, and hatted, and bonnetted, and had started off,

> "Brushing with hasty steps the dew away,
> To meet the sun upon the upland lawn."

All noticed how very grave every thing appeared; there was such a stillness, as if all the birds and beasts were waiting in fear, lest the sun should not rise again. Indeed, I have often thought that the first breaking of the dawn was very awful: the deep stillness—the solemn colour—and the cautious unfolding of the light, is as if something very great and good was about to be done in Heaven—and so there is; for we are to the blessed sun. There is no solemnity like the first dawning of morn:—

> "That vast dumbness nature keeps
> Throughout her starry deeps,
> Most old and mild, and awful, and unbroken,
> Which tells a tale of peace beyond whate'er was spoken.
> LEIGH HUNT.

When they had arrived at the highest part of a rising ground behind their house, they looked over a tract of country, and the sea beyond it, and saw the great sun slowly moving up, while all the clouds around were drawn up from it like long handfuls of wool dyed rose colour, and the edges of them dipped in gold; the wide sea was gold, and all the sky was gold. "We cannot wonder," said Mr. Stock, "that some people should worship the sun as their God, when we behold what a grand object it is, in its rising, and when it is at the height of noon, and in its setting. When we also consider that there is not a single comfort we possess, but we have it by the means of the sun. If the sun were to rise no more, everything in the world that grows, and has life, would die; and *we* should die. There would be nothing in all the world but the ground; for, without the light and heat of the sun, everything would rot and become dust. Therefore we cannot wonder, I say, that some people think that the sun is their *only* God and preserver. But then," continued the father, "I wonder they never thought that, since no one, and no *thing* that we know of, ever made itself, so the sun did not make itself; and that whoever made the sun, he was God."

They now continued their walk into some pretty close, and winding lanes; and now and then passed some little cottages, the children of which were all up, and had been out Maying. Some were making their garlands, and some had finished them, hanging them across the lane before the door. Adam and his sisters said they should like to make a garland too. "Then pray do," said their father, "but I fear you will not find any white thorn blown; it is as yet only in the bud; you must be contented with what field flowers you can pick up; unless, indeed, you meet with some black thorn; which, you know, comes into bloom before the other, but it is not so pretty, for the leaves come after the blossoms have gone off." So they hunted about, and plucked all the little flowers they could find, and put them into their handkerchiefs, because the heat of their hands would have soon killed them. While they were busy, little Tom was endeavouring to get some primroses that were on the top of a high bank: finding them, however, rather out of his reach, he asked Adam to pick them for him, who refused; telling him to try and get them for himself. The father heard this, and rebuked Adam very sharply for being a selfish and unkind boy; and desired him to gather them for his little brother directly; which he did, though not very willingly. For some time after this, he seemed as if he had been thinking with himself; at last he said "I thought you told us, papa, that we were to try and do everything we could for ourselves; and that that was independent."—"Ay! ay!" said his father, 'but I did not tell you to be unkind and disobliging. You *are* to endeavour to do all you can for *yourself*, but at the same time to be always ready *to help every one that wants your assistance.* If you were a man, and could divine very well, would you not try to save a fellow creature, who could *not* swim, and was drowning? Would you tell him that he ought to help himself, or else he would not be "independent?"

Such is the manner in which useful and pleasing information is conveyed in "Adam, the Gardener."

ON BOTANICAL THEORIES AND DR. PROFESSOR LINDLEY.

BY THE EDITOR.

The term theory is very commonly used to bemask some wild fancy with the semblance of science; and I could not bring a stronger example of this than what has been termed the metamorphosis of plants, as must appear at a glance to every reader endowed with common sense.

The doctrine in question is alleged to have originated with Linnæus, in 1759—60, but the distinguished German poet, Goethe thinks very lightly of the fancies which Linnæus termed anticipation, while he claims the honour of discovering (inventing, I should say) the doctrine of Metamorphosis in 1790, a doctrine of which De Candolle is the most distinguished disciple.

The doctrine bears that every part of a plant consists of "disguised leaves," and hence part of the stem, the flower-cup, the blossom, the stamens, and pistils, with the seed vessels, and even fruits themselves, are nothing but leaves in a state of disguise or metamorphosis. "These are all the same," says Von Martius, "in their essence, and only differ according to the intensity of their metamorphosis.

Von Martius further instructs us, that every plant possesses two living forces, one vertical, the other spiral, by the action of which forces the plant is formed. By the action of the vertical force the root goes down and the stem rises up; and, by the spiral force, the leaves, both in their natural state and in their disguised forms of flowers and fruit, are wound about their stem in spiral whirls. As soon, then, as a plant begins to grow, a series of leaves winds upwards around the stem in a spiral direction, and hence a whole plant is considered to consist of nothing more than a vertical axis and a spiral of leaves.

In the more recondite parts of the theory, we are told that a stamen is only a leaf, the filament being the leaf-stalk and the anther the leaf-plate, while the furrow between its two lobes is the mid rib, and the pollen the leaf pulp; that a disk is only the base of the foot-stalks of abortive leaves; and that the pistil with its summit, is only a mid-rib denuded of its rind at the tip, while the seed organ is the expanded leaf-plate of the leaf folded, with its upper surface winding round the axis, and having its edges united and adhering.

A leaf thus folded up into a seed-organ, is termed a carpel, the adherin gedges forming the verge, and buds upon these two edges form two rows of nascent seeds. In some plants, several leaves are said to be thus folded into a carpel, and hence the number of verges will correspond to those of the folded leaf edges.

The cause assigned by De Candolle for this metamorphosis of leaves into flowers and fruit, is *degeneracy*, or, as Dr. Professor Lindley terms it, *stunting*, the parts of a flower being therefore abortive leaves. "A flower," says Dr. Professor Lindley, "is, in reality, a *stunted* branch, that is, one the growth of which is checked and its power of elongation destroyed." "The fruit is, in common language, the flower, or some part of it, arrived at its most complete state of existence; and, consequently, is itself a portion of *stunted* branch."

It would be, I conceive, an unprofitable waste of time, to expose the absurdities of these fancies, which have been generated by the erroneous logic of raising analogies into realities. The analogical resemblances are tolerably made out; but we would not surely conclude, that a butterfly is a bird, or a bat, or a flying fish, because the wings are analogous, no more than we can agree with the theorists in calling a rose or a peach a bundle of abortive leaves.

It seems indispensable for every theory to have a loop-hole through which to escape in case of difficulties; and in the present instance, the escape is made by maintaining nature to be wrong when opposed to the theory. "All dissepiments" (partitions), says Dr. Professor Lindley, "whose position is at variance with the foregoing laws are *spurious*." It is needless to remark that this mode of decision at once quashes all objection, and puts an end to every appeal to fact. Well might M. Le Vaillant say, that "the present state of natural history often exhibits nature making sport of our systems." M. Le Vaillant elsewhere says, that "one fact is enough to demolish a theory;" but here we have a theory demolishing the facts, and calling them *spurious*.

It is in consequence of such exposures as the preceding, that Dr. Professor Lindley has thought fit to set himself against the Editor in private and in public, both in acknowledged wincings and (if we are rightly informed) in anonymous ejections. Let him: he can never get over the sheer nonsense he has published, nor the Editor's exposure of the same, not even with the aid of the Bayswater book manufactory, nor of his friend Dilke to boot. He must wince on, let him do what he may to escape through loop holes, unless he come forward in a manly manner, and acknowledge the fatuity of his blunders. Then his love of truth might be admitted; now he stands ashamed of his errors, and tries, though unsuccessfuly, to undermine the exposer thereof with the public.

DESCRIPTION OF THE PLATES.

FRAGARIA MONOPHYLLA.

ONE-LEAVED STRAWBERRY, OR STRAWBERRY OF VERSAILLES.

Class and Order.
Isocandria Poylgynia.

Generic Character.
Calyx 10—fidus. *Petala* 5—*Receptaculum* seminum ovatum baccatum deciduum.

Specific Character and Synonyms.
Fragaria *monophylla* foliis simplicibus. *Lin. Syst. Veg.* p. 476. Le Fraisier de Versailles. *Duschesne Hist. nat. des Frais.* p. 124.

THE first mention made of this strawberry we find in the *Histoire Naturelle des Fraisiers*, where we have its complete history, and from which we learn that it was originally raised at Versailles, in the year 1761, from seeds of the wood strawberry.

From France this plant has been conveyed to most parts of Europe, how it has happened we know not, but it is certainly very little known in this country: in the 14th edit. of the *Syst. Veg. of Linnæus*, it appears as a species under the name of *monophylla*, originally imposed on it by DUCHESNE; LINNÆUS, however, has his doubts as to its being a species distinct from the *vesca*, and, in our opinion, not without reason; for it can certainly be regarded as a very singular variety, only its origin is indeed a proof of this; in addition to which we may observe, that plants raised from the runners will sometimes, though very rarely indeed, have three leaves instead of one: and it is observed by the very intelligent author of the *Hist. Nat.* above mentioned, that seedling plants sometimes produced leaves with three divisions like those of the wood strawberry. Besides the remarkable difference in the number of leaves of this plant, the leaves themselves are observed to be much smaller in the winter season, and their ribs less branched; the runners also are slenderer and more productive, and the fruit in general more oblong or pyramidal. As an object of curiosity, this plant is deserving a place in every garden of any extent: nor is its singularity any recommendation, its fruit being equal to the finest wood strawberry, with which it agrees in its time of flowering, fruiting, and mode of treatment.

FRANKLIN'S TARTAR.

A SCARLET BIZARRE CARNATION.

The carnation here exhibited is a seedling raised by an ingenious cultivator of these flowers. We have not figured it as the most perfect flower of the kind, either in form or size, but as being a very fine specimen of the sort, and one whose form and colours it is in the power of the artist pretty nearly to imitate.

The *Dianthus Caryophyllus or wild clove*, is generally considered as the parent of the carnation, and may be found, if not in its wild state, at least single, on the walls of Rochester Castle, where it has been long known to flourish, and where it produces two varieties in point of colour, the pale and deep red.

Flowers which are cultivated from age to age are continually producing new varieties, hence there is no standard as to *name*, *beauty*, or *perfection* amongst them, but what is perpetually fluctuating; thus the *red Halo*, *blue Halo*, the *greatest Granado*, with several others celebrated in the time of Parkinson, have long since been consigned to oblivion; and it is probable, that the variety now exhibited may, in a few years, share a similar fate, for it would be vanity in us to suppose, that the carnation, by assiduous culture may, in the eye of the florist, be yet considerably improved.

To succeed in the culture of the carnation we must advert to the situation in which it is found wild, and this is observed to be dry and elevated; hence excessive moisture is found to be one of the greatest enemies this plant has to encounter; and on this account it is found to succeed better when planted in a pot, than in the open border; because in the former, any superfluous moisture readily drains off; but in guarding against too much wet, we must be careful to avoid the opposite extreme.

To keep any plant in a state of great luxuriance, it is necessary that the soil in which it grows be rich, hence a mixture of light loam, and perfectly rotten horse or cow dung in equal proportions, is found to be a proper compost for the carnation. Care should be taken that no worms, grubs, or other insects be introduced with the dung, to prevent this, the dung when sifted fine, should be exposed to the rays of the sun, on a hot summer's day till perfectly dry, and then put by in a box for use, still more to increase the luxuriance of the plants, water them in the spring and summer, with an infusion of sheep's dung in the water.

The Carnation is propagated by seeds, layers, and pipings; new varieties can only be raised from seed, which however is sparingly produced from good flowers, because the petals are so multiplied as nearly to exclude the parts of the fructification essential to their production.

The seed must be sown in April, put in boxes, very thin, and placed upon an East border.

In July transplant them upon a bed, in an open situation, at about four inches asunder; at the end of August transplant them again upon another bed, at about ten inches asunder, and there let them remain until they flower; shade them until they have taken root; and in very severe weather in winter cover the bed with mats, over some hoops.

The following summer they will flower, when you must mark such as you like, make layers, frame and pot them.

The means of increasing these plants by layers and pipings are known to every gardener, Such as wish for more minute information, may consult the new Editon of Miller's Gardener's Dictionary.

PRIMULA VILLOSA, MOUNTAIN PRIMULA.

PENTANDRIA MONOGYNIA.

Involucrum umbellul. *Corolla* tubus cylindricus: ore patulo.

Primula *villosa* foliis obovatis dentatis villosis, scapo brevissimo multifloro.

Primula *villosa, Jacquin Fl. Austr. app. b. v.*

The plant here figured has been introduced pretty generally into the nursery gardens in the neighbourhood of London within these few years, and has for many years been cultivated in a garden in Yorkshire.

It is not noticed by Linnæus: Professor Jacquin, in his Flora Austriaca, has figured and described a primula, which, though not agreeing so minutely as could be wished with the one we have figured, is nevertheless considered by some of the first botanists in this country as the same species; he gives it the name of *villosa* which we adopt, though with us it is so slightly villous, as scarcely to deserve that epithet.

It varies in the brilliancy of its colours, flowers in April, and will succeed with the method of culture recommended for the round-leaved Cyclamen.

ERANTHUS HYEMALIS. WINTER HELLEBORE OR ACONITE.

Polyandria Polygnia.

Petala 5 fine plura. Nectaria bilabiata, tubulata.

Capsulæ polyspermæ rectiusculæ.

Helleborus *hyemalis* flore folio insidente. *Linn. Syst. Vegetab. p.* 431, *Sp. Pl. p.* 783.

Aconitum unifolium bulbosum. *Bauh. Pin.* 183.

The Winter's Wolfesbane. Park Purad. p. 214.

Grows wild in Lombardy, Italy, and Austria, affects mountainous situations, flowers with us in February, and hence is liable to be cut off in severe frosts. "It is propagated by offsets which the roots send out in abundance. These roots may be taken up and transplanted at any time after their leaves decay, which is generally by the beginning of June till October, when they will begin to put out new fibres, but as the roots are small, and nearly the colour of the ground, if care is not taken to search for them, many of them will be left in the ground. These roots should be planted in small clusters, otherwise they will not make a good appearance, for single flowers of these small kinds so scattered about the borders and scarcely seen at a distance, but when these and the snow drops are alternately planted in bunches they have a good effect, as they flower at the same time and are nearly of a size."

SCHIZANTHUS RETUSUS.

SCHIZANTHUS.

Diandria, Monogynia: Linn. Scrophularineæ, Jussieu.

Calyx, five-parted somewhat unequal. Corolla, limb in four parts, lobed, irregular, plaited while expanding; tube narrow and short. Stamina four, two upper ones barren, filaments all adnate. Anthers inserted below in two places, confluent at the top. Ovarium of two locaments placed on a smooth fleshy disk. Stigma compressed, obtuse, of two united lobes. Capsula of two places, containing many seeds; valves divided. Dissepiments parallel. Placenta two, spongy. Seeds simple, shell-like, having a hard wringled integument; albumen fleshy. Embryo arched; the rostel roundly obtuse and twice as long as the seed leaves.

This flower is an annual plant of great beauty, of tolerable easy culture, growing from seeds which ripen freely, if the plants be kept in an airy situation at the time of flowering.

Those intended for the principal flowering should be sown the previous summer, or early in the autumn; and in February and March two more sowings should be made to succeed each other. The autumn sowing, or rather those of the previous summer, should be made in the middle of July and beginning of August. Light rich mould is the most suitable for the purpose.

GREWIA ELASTICA.

The description of this flower must be deferred till next month.

MECONOPSIS ACULEATA.

Meconopsis aculeata, caule erecto sulcato ut plantæ omni parte aculeato, foliis longe petiolatis oblongis decurrentibus subpinnatisectis sinubus obtusis, floribus auxillaribus solitariis terminalibusve paniculatis, capsulis oblongis, utrinque acutis dense aculeatis.

Stem ascending, erect, from one to two feet in height, leavy, furrowed, and like every part of the plant, except the petals and stamens densely aculeate. The leaves long-petioled, oblong, subpinnatifid, with irregular and obtuse sinuses, frequently decurrent on the petioles, upper ones sessile. Petioles broad and sheathing at the base. Flowers axillary and terminal, often in the axillæ of all the leaves, long peduncled. Calyx 2-sepaled; sepals roundish, oval, caducous, aculeate. Petals 4, obovate roundish, red. Stamens very numerous: filaments capillary; anthers oblong, inserted by the base; ovary ovates pointed, aculeate. Style half the length of the ovary; after the flower has fallen, it becomes elong ted and twisted. Stigm. s 4, oblong, united into a capitate head. Capsules oblong, tapering towards both ends, 1-celled. Verges ribbed intervalvular; valves 4 to 5, separating from the placentæ at the apex of the capsule for the escape of the seeds. Seeds numerous, minute.

CORYDALUS GOVANIANA.

C. Govaniana; Wall.) foliis petiolatis oblongis bipinnatisectis, segmentis cuneatis profunde pinnatilobatis, lobis linearioblongis obtusis cum cuspidula integris vel bilobis, racemis secundis, bracteis foliaceis cuneiformibus inciso-lobatis pedunculos superantibus, supremis lanceolatis integris, calcare pedicello subæquali, siliquis pendulis oblongis urtinque acutis apice stylo longo acuminatis.

This plant was first described by Dr. Wallich, in his Tent. Fl. Nep. p. 55, and there is little to be added to his description. It was supplied to him by Dr. Govan from Gurhwal. It is extremely common in the Himalayan mountains, particularly on the Choor, above 8,000 feet of elevation. It varies from a few inches to nearly a foot in height.

1. Convolvulus Turpethum.

2. Oxalis rubella

3. Morœa Collina

4. Scilla amœna.

5. Ranunculus polypetalus.

6. Viola Kunawrensis.

7. Corydalis Cashmeriana.

8. Anemone discolor.

EXPERIMENTS ON THE EFFECTS OF REMOVING POTATOE BLOSSOMS.*

BY MR. JAMES MURRAY, OF ABERDEEN.

The experiment was made according to the plan laid down by the Highland Society in their list of premiums for 1833.

The quality of the soil was not the best adapted for a very successful potatoe crop, but as I did not think of making the experiment until after the ground had been sown, I had no alternative left me. At the same time, I believe, that an experiment of this nature, although made upon a crop raised in soil not peculiarly well adapted for its culture, will be quite as satisfactory in determining the advantages or disadvantages of it, as one made upon a more congenial soil. The soil consisted, throughout the two acres upon which the potatoes had been sown, of a very shallow loam, upon a bed of what is generally called till. The field had been well drained, but like every other field of the same nature of soil, (unless where Mr. Smith, of Deanston's, trenching plough may have been used,) continues in what may be called a cold damp state, and therefore an enemy to the potatoe.

The variety of the potatoe sown, was one which had been brought from Ireland some years ago, by a gentleman of this neighbourhood, and is called the red potatoe in this neighbourhood.

I divided the whole field into parts of *three* drills each, and having explained what I wished to be done, to a few children of from nine to twelve years old, previous to the appearance of any blossoms, they never allowed a day to elapse without looking after their charge, and no sooner had a blossom begun to appear, (or in bud,) upon No. 1. of each part, than it was certain to be immediately plucked off. The other two drills of each part remained untouched until the blossoms upon No. 2, seemed to be fully expanded, when they were also plucked off, while No. 3, was allowed to ripen its fruit. By arranging the drills in this manner, I could depend on being more correct in having the soil of each of the drills of each part exactly similar than I could have been, had I divided the field in the manner proposed by the society.

The preceding part of the experiment was (as it must appear to be) very simple indeed, and attended with no expense whatever; for there are always children in the neighbourhood of a farm, who will do the work for a few pence a day.

The most difficult part of the experiment to arrange, was the taking up of the crop, so that there might be no interference between the different drills. To obtain this, I took three carts, one of which was appropriated entirely by No. 1, of each part, another by No. 2, and the remaining one by No. 3. In this manner I prevented the very slightest mingling of the potatoes.

The quantity of potatoes which each cart held, was exactly ascertained, and the management of this part of the experiment being given to one person, it was his business to mark down how many loads each cart took to the potatoe pit.

After the whole crop had been taken off the field, and the overseer's note book examined, the following was the result:

Drills, No. 1, being those from which the blossoms were plucked in the bud, contained 30 bolls, 2 bushels.

Drills, No. 2, being those from which the blossoms were plucked when in full flower, contained 27 bolls, 3 bushels.

Drills, No. 3, being those upon which the fruit was allowed to ripen, contained 26 bolls. The superiority, therefore, of No. 1, over No. 2, was 2 bolls, five bushels; over No. 3, was 4 bolls, 3 bushels; and of No. 2, over No. 3, was 1 boll, 3 bushels.

From the above experiment it would appear, that the potatoe crop had been improved by having the blossoms plucked off, and that according to the period at which it had been done. At the same time, the difference is perhaps not much more than would be counterbalanced by the additional trouble given in taking up the crops; for although regulated as well as possibly could be done, still it could not be taken up in nearly the time in which it would have been done, had the drills been resorted to indiscriminately.

The quality of the potatoe is remarkably good: it is of a mealy nature, and an uncommonly good keeper. We were using them last year here, in preference to early potatoes.

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* From the Trans. of the Royal Highland Society.

ON TRANSPLANTING LARGE TREES.*

BY E. MURPHY.

A GREAT book, the adage says, is a great evil—an expensive book is also an evil, and the more so, if it treat on subjects which ought to be familiar to persons whose means do not admit of purchasing expensive works. Both these objections apply with peculiar force to a work published a few years ago on this subject. That Sir Henry Steuart's book possesses an uncommon degree of merit, both as regards the subject, and the manner in which that subject is treated, I would be the last to deny. In arrangement, elegance of style, and many other attributes, it is such as was to have been expected from Sir Henry's classic pen; its almost only fault, in my opinion, is the length to which a subject, capable of having ample justice done to it in a few pages, has been extended. But my object in what follows is not to review "The Planter's Guide," which I earnestly recommend to every person interested in ornamental planting, and who can afford to possess it, promising him great pleasure and much information in the perusal of it—it is to lay down a few rules, the result of observation and experience, by which any ordinary planter may effect what, by the learned manner in which Sir Henry Steuart has treated it, many suppose to be attended with almost insurmountable difficulty. With this view it may be necessary to say a few words on the subject of the nature of trees in general.

Every one knows, that when the seed of a tree, or of almost any other plant, is committed to the earth under favourable circumstances, it vegetates and produces a plant, that this plant also, under favourable circumstances, increases, until at length it becomes a perfect specimen of its particular kind. These favourable circumstances are, in the former case, a certain degree of air, moisture, warmth, and, I may add, exclusion from light—and in the second, soil, situation and shelter, necessary to its perfect development. But how vegetation in the former, and increase in the latter, is effected, has baffled the ingenuity of the most acute physiologists to determine. They suppose that moisture causes the juices in the seed to undergo a kind of fermentation, by which sugar is produced, which serves to nourish the plant until it is provided with roots; that the roots being formed, ramify and suck up from the earth, by their fibres, water, either pure or having dissolved in its animal and vegetable substance, salts, &c.; that this *sap* having ascended to the leaves, is spread out, and parts with a portion of its watery particles, which are exhaled by the sun; that the now inspissated or thickened juice, returns by ducts (veins) in the back of the leaves, and in its progress back to the roots, not only supplies nourishment to the different parts, but deposits an annual layer of wood beneath the bark.

Taking for granted that this theory is correct, it follows, with respect to trees, that they will thrive best in a deep, friable (*loose*) soil, in which their roots can easily spread in search of nourishment; one capable of retaining the proper degree of moisture, in which the roots will neither be saturated in winter nor parched in summer, and which possesses a quantity of decaying vegetable or animal matter; and this we find in practice is the fact, provided, which is generally the case, that such soil is sufficiently sheltered. It also follows, that the fibres of the roots, and the leaves of the tree, being the important agents in vegetation, the more of each the tree possesses, the more rapid will be its increase in stature.

Bearing in mind the above principle, we may proceed to the subject of removal, which, for convenience, may be treated under the heads—selection—preparation of the soil—removal—after treatment—expense.

First—*Selection.* Trees which grow in situations fully exposed to the wind, and which stand at such a distance from each other as not to afford mutual shelter, are found to possess the following properties: abundance of branches, robust trunks, thick bark, firmly rooted in the ground, and roots corresponding in quantity and in extent to the branches—whilst those which grow in masses, so as to shelter each, and, to use a practical term, draw each other up, have long trunks, with few branches, and these only at the extremity, a thin bark, and few roots, running near the surface of the ground. The former are only fit for removal into open situations, the latter, particularly if under twenty years growth, may be removed with safety, provided they be replanted in large masses and sheltered situations. This adaptation to particular situations has been insisted on at a great length by Sir Henry Steuart, yet it is almost never sufficiently attended to by those who remove large trees, as the failures and unhealthy appearance of those that survive, in most places, sufficiently indicate: indeed, it is not a little extraordinary that the very persons sent by Sir Henry Steuart to this country for the purpose of transplanting large trees, either through ignorance (which is hardly to be supposed) or a want of proper subjects, made use in some places, (as at Woodstock, these at of Lord R. Tottenham, in the county of Wicklow,) of

* From the "Irish Farmer's and Gardener's Magazine."

those quite unfit for the purpose, and the failures have been proportionate to the want of judgment displayed in the selection.

It frequently happens that trees possessing the requisite qualities for removal into open situations, do not occur on the estate where they are required, in which case handsome trees should be selected in situations where they can be spared, and all others in their immediate vicinity should be removed, not at once, for then they would receive a check from which they would slowly, if ever perhaps, recover, but gradually; and a trench should be opened round about, and at, perhaps, three yards distance from the trunk of a tree (suppose it to be of about thirty years standing); the trench should be about eighteen inches wide, and at least two feet deep, and should be filled with some good earth or compost, for the purpose of causing the roots which have been cut in opening the trench, to push out a quantity of fibres; this should be done at *least two years* before the tree is to be removed—if but one, as is very often the case, the fibres will be so tender as to be liable to be destroyed in the operation. In opening the trench, Sir Henry Steuart recommends that the very strong roots which may be met with, be not cut or injured, but left at length to serve as stays for holding the tree steady after it has been shifted. This artificial method of multiplying the fibres was in use not only as a preparation for removing fruit trees, but even for forest trees—those which have grown in exposed situations do not require it. But the best method of preparing trees for removal, is that long since practised, and recommended by Boucher in his excellent work on nursery business—namely, to remove trees intended for final transplantation, at a large size, repeatedly—say once in three or four years, until they are twenty years old. Were nursery men, who have a large sufficiency of land in the vicinity of large cities, to apply a portion of it to this branch, there is little doubt they would be remunerated, sogreatan object is it to afford the person of taste a means of at once beautifying his lawn and pleasure ground.

Preparation for receiving the tree in its new situation.—To determine the best possible site for the new tree is sometimes a matter of considerable difficulty, in which case the judgment will be assisted by making use of a young tree of such a size as that a man can readily carry it—the lower part of the trunk of which being sharpened, may be inserted in a hole formed by a stake and mallet—the effect will by this means be anticipated. This matter being determined, an excavation in size, corresponding to the roots of the tree intended for it, which for a tree of from thirty to forty years old should seldom be less than eighteen feet in diameter, should be made at least two and one-half feet deep; the good earth being laid at one side, and the bad at another, with a space of eight or ten feet, on which no earth is to be thrown: the bottom of the whole being loosened with a pick, so that water may not remain in it after the tree is planted, the sod, if such there was, is to be thrown in and chopped fine, after which, good earth formed by adding friable black moor, or what would be far better well rotted dung, to the earth, which was taken from the hole; it is to be put into the hole so as to raise it to the required height—a sufficient quantity of the compost should also be ready for filling. The hole being thus prepared, the tree is to be raised, in doing which, Sir Henry Steuart recommends that a trench, such as that described for preparing the tree, be formed around the tree, at a distance corresponding to the size of the tree, generally almost as far from the trunk as the branches extend. Where a preparing trench was made, that now described must be formed immediately without it. This trench being about two feet deep, and of such width that a man can stand in it and use a shovel. A set of careful persons, six or eight in number, each having a light one pronged pick, commence at the inner margin of the trench, and with his head towards the trunk of the tree loosens the earth, letting it fall into the trench, from which it is removed by the man with a shovel. In this way much fewer roots are damaged than if spades were used. The roots, when exposed, are to be preserved from injury, by being tied in bundles with hay ropes, and some of the largest roots are to be pursued to their extremity, and taken up entire. The tree being thus disengaged, the timber carriage, which differs in no respect from the janker used in all seaport towns for transplanting logs of timber, except that this is much lighter in construction, and has a platform or bolster above the axletree, is brought up to the tree, and the pole of it fastened to the trunk by a rope. The pole of the machine, with the tree attached, is then pulled down, by which the roots are raised, and the tree is now ready to be drawn to its destination—roots foremost. When arrived there, any roots or branches which may have been broken by accident may be removed: but should none be injured, none are to be taken off. In planting, the side of the tree which in its original situation was presented to the storm, must now be turned from it, by which means the short branches will become long, and the long ones checked, so that the tree will recover a just balance. Sir Henry Steuart has the merit of this discovery as applied to trees—every gardener practises it with his greenhouse plants. The tree is now, we will suppose, seated in its new birth—to retain it firmly there, Sir Henry uses no other means than carefully ramming the earth around the small ball which always adheres to the tree, and disposing the roots, which are to be

spread out in their natural directions, tier above tier—filling every crevice, and firming the earth well down. But with larger trees than Sir Henry is in the habit of removing, and in more exposed situations, I am of opinion, that additional supports will be used with advantage. I have elsewhere described a method used by Mr. Paxton, at Chatsworth, the seat of the Duke of Devonshire, by which, in an exposed situation, he maintained in an erect position trees of an astonishing elevation. His method is—to drive three strong posts into the ground, so that their tops shall be level with the upper part of the strong roots of the tree; on the tops of these three posts, rails pressing upon the roots are spiked; and this being firmly done, the tree is immovable; the earth is then filled in, and raised somewhat higher than the surrounding ground to admit of sinking; a good watering is given, which must be repeated occasionally throughout the spring and summer; and a coat of bog stuff, or, if it can be spared, rotted dung, must be spread on the surface, to prevent evaporation. Sir Henry Steuart recommends shoves (the refuse procured in dressing flax); but the manufacture of flax being unfortunately no longer worth attending to in this country, shoves are not to be had. In this way every kind of tree may be removed; but elms, limes, oaks, alders, and poplars, with least risk. Any open weather, from the fall of the leaf to the beginning of March, will answer for performing the operation; if the ground be liable to retain a superabundance of moisture, or be much exposed to storms, spring is the best season. Under other circumstances, autumn and the beginning of winter is decidedly preferable.

With respect to *expense*, that will of course depend as well on the size of the tree, as on the distance and nature of the ground over which it is necessary to transport it, rate of wages, &c. &c. As general approximate it may be said, that trees of from ten to fifteen years growth, the roots of which do not extend beyond four feet from the trunk, may be taken up and replanted for one shilling each. I have had many scores of such removed from plantations where they were too close, and replanted at two pence each; but then they were placed in sheltered places, and it was not necessary to be very solicitous about taking them up. A tree of about twelve or eighteen inches in circumference at the ground, as many feet high, and from twenty to thirty years growth may, under ordinary circumstances, be removed and replanted for about eight shillings. For trees considerably beyond that size, the expense will be much greater than the proportionate size of the tree would lead a person inexperienced in the business to suppose.

ON LEAVES OF PLANTS.

BY J. S. DUNCAN, A.M.

The curiously mechanised organs of the root and stem manifestly tend in the first place to the formation and evolution of leaves. "The leaf," says Thomson, Lect. ix. p. 478. "is a temporary organ of plants, which performs nearly the same functions in the economy of vegetable life which the lungs perform in that of animal life; or, in fewer words, leaves are the respiratory organs of plants: in aphyllous (or leafless) plants, the surface of the stem performs the function of the leaves. But herbs, and the soft part of woody plants, absorb moisture from the atmosphere by the pores of their epidermis." That moisture is absorbed by the leaves, as well as by the root, appears manifest from the experiments of Du Hamel, Mariotte, and Bonnet, enumerated by Keith, vol. ii. ch. iii. p. 92. The moisture, thus imbibed, is quickly decomposed in the leaf by a continual and rapid process of perspiration, which appears necessary to the decomposition, elaboration, and assimilation of the components of atmospheric air and of water, the elaboration of the sap, of carbonic acid, and of oxygen.

"The principal part of the elaboration of the sap," vol. ii. ch. iii. p. 136, "is operated in the leaf: for the sap no sooner reaches the leaf, than part of it is carried off by means of perspiration, perceptible or imperceptible; effecting a change in its component parts, and by consequence a change of its properties."

"Bonnet has shewn, that most leaves absorb moisture better by one surface than another; and it is known that some surfaces actually repel it, as drops of rain roll along the upper surface of the cabbage leaf without wetting it," ch. iii. p. 97.

Various experiments show that leaves vary in respect to this capacity, some absorbing better by the upper, some by the lower surface. The absorption was thus demonstrated by Mariotte. He cut a branch terminating in two twigs, one was suspended within, the other hung without a vessel filled with water: that which hung without preserved its verdure, while the other withered.

Leaves, during the day, and particularly in the sun, inhale carbonic acid gas; "but the gas thus inhaled is not assimilated immediately, or at least not wholly, for it is known to be evolved when they vegetate in the shade, and during the night."

Ingenhouz observed, "that leaves placed in water and exposed to the sun's rays evolve oxygen gas:" Sennebier afterwards ascertained, "that this process only takes place when leaves are fresh, and the water

impregnated with carbonic acid." Of the effect of light in promoting this process, there can be no doubt: how it operates is yet among the unexplored secrets of nature. The root, the wood, the petals, and leaves, that are faded, and have lost their healthful colour, (which is commonly green, of various shades, but sometimes red and variegated,) are not found to exhale oxygen gas. The effect is operated chiefly by the parenchyma, or green portion of the plant. Keith, ch. iii.

The parenchyma is fluid or granulated matter, found in minute cells of leaves and leaf-stalks. "In thin leaves, the cells near the inferior disk are more transparent than those near the upper disk; but in both we perceive a number of granules, which are more opaque and of a deeper green as the cells containing them approach the upper disk. In succulent leaves, and those which maintain a vertical position, the opacity and green colour of the granules are the same towards every face of the leaf; but they are generally colourless in the centre. In the cells of some leaves, regular crystallized salts are found, in others the fluids are tinged of different hues, in which cases the leaves display the same hues on one or both surfaces." Thomson, Lect. x. p. 595.

Mr. Keith, after noticing that oxygen gas, that constituent of atmospheric air which has been found to be indispensable to the life of animals, is no less so to the life of vegetables, yet nevertheless, that plants thrive better in common air than in pure oxygen gas, concludes excellently; "From whence it follows, that oxygen, though the principal agent in the process of vegetation, is yet not the only agent necessary to the health and growth of the plant, and that the proportion of the constituent parts of the atmospheric air is just what it ought to be, as well for the purposes of vegetable as of animal life, being at once an indication both of the wisdom and goodness of Him by whom it was established." Vol. ii. p. 175,

"Among fallen leaves, which have been exposed to the action of the atmosphere in a damp place, we find some in which the cuticle and pulp are completely destroyed; whereas the ribs or veins, as they are erroneously termed, being less susceptible of decomposition, remain almost entire, and display a beautiful tissue of complicated net work. This is the vascular system, and the leaf in this state is termed a skeleton leaf. Artificial preparations of skeletons, by macerating skins in water, preserve the most minute cords of the vessels, and enable us to trace with the greatest readiness the divisions, sub-divisions, and various ramifications of the vascular fasciculi. In Phil. Trans. 1730, No. 414, p. 371, Francis Nichols gives an account of the skeleton of a pear leaf, the net-work of which he split into two equal layers." Thomson, Lect. x. p. 549.

"The fibres are not only subdivided into a variety of ramifications forming a fine net-work, but that net-work is double, consisting of two layers, the one corresponding to the upper, the other to the under surface of the leaf. No language is able to convey an idea of the delicacy and intricacy of the web. Linnæus discovered the points of union between the layers, and remarked that the net-work corresponding to the under surface was much less firm and compact in its texture than that corresponding to the upper surface." Keith, vol. i. sec. iv. p. 275.

"Leaves," says Sir J. E. Smith's Grammar of Botany, p. 9. "receive the sap from the wood by one set of vessels, and expose it to the action of the air, light and heat, by their upper surface, while what is superfluous passes off by the under. The sap thus changed, assumes peculiar flavours, odours, and other qualities, and is sent by another set of vessels into the bark, to which it adds a new layer every year internally, and another layer to the external part of the wood. Hence the concentric circles in trees; the number of which shows their age, and the breadth of each circle the abundance and vigour of the foliage which formed it."

A volume, or rather many volumes, instead of a general indicative outline, or short essay, might be fully devoted to trace the analogy between the vascular system of animals and that of plants. That such analogy does exist to a certain extent, every reader of the works of Keith, Smith, and Thomson, must be readily convinced. Animals, as well as plants, derive nutrition and the maintenance of their subsistence from extraneous substances; vessels are placed just where they are indispensably requisite, adapted to select the juices suited to such purpose in the forms of sap and chyle: other vessels are adapted to receive the first modified fluid, and to promote its necessary changes into proper juice, for the purpose of various assimilation into blood, and bile, and saliva, and synovia, &c. in animals, and into saccharine and other juices, oils, and resins, in plants. Leaves, like lungs, expose the involved fluids to the action of air which they decompose, and in that action undergo changes essential to vitality. Not to pursue the comparison further than this point for the present, it is scarce possible not to perceive, even in this cursory glance, that the wide difference between the locomotive animal, deriving nutrition only from the introsusception of previously organized substances, and the permanently fixed vegetable, "effecting the development of its parts by the introsusception and assimilation of unorganized substances, derived from the atmosphere and from the soil," (Keith, vol. ii. p. 471), cannot be the result of one uniformly acting undesigning principal, one blind impulse, attraction, or gravitation: that the adaptation of the nicely measured and suited parts and vessels to the successive purposes and the common obvious end, the continuance of vital subsistence, must be the result, in plants as well as in animals, of an operative power, which made long beforehand

preparations for changes predestined to exist at a remote season; changes necessary to the continual production and support of successive races of living beings, capable at least in part, if not in the whole, of moral, as well as of physical enjoyment, for a period distinctly limited, as to each individual of successively life-receiving and life-yielding beings, through a long succession of generations.

But nothing can more simply, clearly, and obviously display the unlimited extent of that mysteriously operating power or spirit, which has pervaded and modified, and still pervades and sustains every part of creation, from the bright centres of celestial systems, from the ellipses of the planets and the comets, to the nervous ganglion of a worm, or the calyptra of a moss, than the infinite diversity of forms and modifications of the most familiar objects. It seems as if an angel's voice was heard from every leaf, exclaiming to the systematic caviller, Look at the leaves of one hundred thousand species! In every species they are different; among myriads of myriads of leaves no two exactly resemble each other! Of the varieties of forms, surfaces, attachments, directions, consistences, colours, pubescence, aggregation, &c. of gems, or buds, of footstalks, of leaves, and of their general appendages, thorns, tendrils, glands, bladders, spathes, involucra, &c. several hundreds are enumerated in Thomson's "Methodical Index of Organs," In some plants, whose stems are very succulent, leaves are wholly wanting, such as salicornia, cuscuta, stapelia. What terms of language could so strongly express, what characters could so intelligibly designate, the eternally important truth—The power that made this scene of wonder is a living law unto itself: it is without limit, capable of infinite diversity, controlling, not controlled by any properties, vital, mechanical, or chemical; the source of all the means of all diversified existence, of all relations throughout all extent and variety of being?

On the subject of vegetable vitality, Keith forcibly observes, vol. ii. p. 438. "The best evidence of its presence is that of its rendering the subject in which it inheres capable of counteracting the laws of chemical affinity. This rule, which seems to have been first instituted (especially insisted on) by Humboldt, is obviously applicable to the case of animals, as is proved by the process of the digestion of food, and its conversion into chyle and blood; as well as from the various secretions and excretions effected by the several organs, and effecting the growth and development of the individual, in direct opposition to the acknowledged laws of chemical affinity; which, as soon as the vital principal is extinct, (*i. e.* withdrawn,) begin immediately to give indication of their action, in the incipient symptoms of the putrefaction of the dead body. But the rule is applicable to the case of vegetables, as is proved by the introsusception, digestion, and assimilation, of the food necessary to their development; all indicating the agency of a principal capable of counteracting the laws of chemical affinity, which, at the period of what is usually called the death of the plant, begin also immediately to act, and to give evidence of their action, in the incipient symptoms of the putrefaction of the vegetable."

It must be further observed, that the relations of leaves extend far beyond the mere nutrition of the plant, of which they form a part. They contribute, in their healthy state, to maintain the purity and salubrity of the atmosphere during the action of light upon their surfaces, which surfaces, it is obvious, must far exceed in their aggregate of extent, that of the whole earth, perhaps of the whole terraqueous globe. They afford to the far greater number of animals the principal portion of their food. The teeth and stomachs of the larger grazing animals, the pachydermata, and ruminantia, and most of the rodentia, demonstrate their special destination and adaptation to this species of food. Is it possible to consider these extensive relations of one totally distinct class of beings to another of a widely different nature, and conclude that such close and multitudinous connexions, of adaptations, ties, and mutual dependences, can be casual, or without an adapting, an arranging cause? Is such conclusion reason, or is it madness? But leaves supply no small portion of the food of man: the varieties of cabbage, spinach, lettuce, celery, thyme, sage, sorrel, parsley, fennel, are too familiar for further enumeration. In Britain, as well as in China, tea has become almost a necessary part of food amongst all ranks; and since the days of Raleigh, the luxury of tobacco has, with rapid and unexampled progress of proselytism, spread its influence, holding, like wine, a sort of middle rank between food and medicine, from the western coasts of America to the eastern extremity of Asia.

ON THE EXCRETORY POWERS OF PLANTS.*

BY S. W.

I HAVE read with considerable interest the articles on the rotation of crops and the excretory powers of plants in the two last numbers of the journal, and do hope that some of your correspondents may soon, by further experiment, be enabled to give more information on the subject. In the mean time, I would offer you a few remarks which have occurred to my mind.

You inform us, that M. Macaire seems to have ascertained that plants which display their flowers, exude matter from their roots; and I am inclined to think that it is only then, or when plants are forming and ripening their seeds, or dying, that exudation takes place to any extent, or such as to render the soil again unfit for carrying the same crop to advantage; for we know that onions, and I believe, I may say, every garden vegetable, may be cultivated in the same plot of ground year after year, with the assistance of manure, to advantage, except pease and beans, which are permitted to form the seed. Your correspondent, Mr. Towers, also justly includes the rasp amongst the defilers of soil, which I would account for by its peculiar growth, namely, the wood *dying* every year, after having yielded the fruit.

This new discovery (if I may so call it) explains the remark of that wonderful man. Lord Kames, in the "Gentleman Farmer," that plants exhaust or defile the soil chiefly when forming and ripening their seed. "Culmiferous plants," says his lordship, "having small leaves, and few in number, depend mostly on the soil for nourishment, and little on the air. During the ripening of the seed, they draw probably, their whole nourishment from the soil, as the leaves by this time, being dry and withered, must have lost their power of drawing nourishment from the air. Now, as culmiferous plants are chiefly cultivated for seed, and are not cut down till the seed be fully ripe, they may be pronounced all of them robbers, some more and some less. But such plants, while young, are all leaves, and in that state draw most of their nourishment from the air. Hence it is, that when cut green for food to cattle, a culmiferous crop is far from being a robber." But to show that they defile it only, and do not exhaust it,—I tried an experiment about five years ago: Having often seen cresses growing in flannel moistened with water, I took that plant for my experiment, and sowed the seeds in a flower pot filled with stocking, well washed to take the oil out of it; and the plants not only grew, but ripened their seeds, thus proving that plants do not require soil to bring them to maturity.

The practice of General Beaston sowing wheat on the same land year after year, (not that I recommend it,) cannot, I think, be explained on any other theory than that of destroying or decomposing the exudation of wheat by fire, that he was enabled to get such crops as he did. But I consider liming a better way of decomposing the exudation of plants; and as grass, oats, and barley are all of the same family, I have no doubt that this is one reason why it answers so well to lime land when laying it down to grass, and sowing barley; namely, the lime decomposes the exudation of the barley, and prevents its injuring the grass plants. Many old fashioned farmers are still fond of spreading lime on grass land before breaking it up for oats; and I have no doubt, in the same way, the lime, by acting on the exudation of the grasses, prepares it as food for the oats, which it might otherwise injure.

I therefore hope you will continue to encourage those who are enabled to make experiments on grasses, and particularly as to the time when the exudation from their roots takes place, as we would then be taught the proper time for cutting hay; we would be taught if it was desirable to depasture our grasses so close as to prevent them seeding or flowering;—we would be taught whether or not we ought on all occasions to be at the expense of perennial grass seeds, if, by the dying of the annual rye-grass, the land is rendered afterwards unfit for oats;—perhaps we would be taught not to take oats at all in breaking up from grass, which is almost the universal practice at present, for we ought to remember that oats and grass are of the same family. I feel confident that in this particular, alteration may be made with advantage in the general rotation of the country; and I have no doubt another crop may be had without any extra manure, which would be no small advantage to the farmer. I am not prepared to say what crop should be taken in breaking up from grass. That must depend much upon the soil and other circumstances; but I have known beans taken with advantage, and it must be either beans, vetches, pease, or potatoes; then oats, turnips, with dung, barley, grass, keeping the land in grass one, two, or three years, and giving lime with the barley every twelve or fourteen years.

* From the "Quarterly Journal of Agriculture."

ON THE GROWTH AND CULTURE OF TULIPS.*

BY W. B. P. OF HULL.

The plan I have pursued for the last twenty years is simple, and one I have always found to answer my most sanguine expectations except through misfortune by frost, hail, &c.; against such unforeseen circumstances it is almost impossible to guard. I always plant my tulips about the 8th to 12th of November, 3½ to 4 inches deep, on a bed raised by side boards about a foot from the surface; which in our heavy cold soil gives room for the superfluous water to drain off. I always plant them in the soil taken from the ranunculus bed, which ranunculus bed I generally manure at the latter part of the year with cow dung, and throw the tulip bed on the ranunculus bed, which is manured again in the same manner, with an exception in the year 1832; that season I manured my ranunculusses with rape dust. I took of the soil as before, and I never remember having had so fine a bloom; this at once proves the superiority of the manure. I generally take out a spade depth. Some florists will tell you manure will cause them to run in colours; this I grant will be the case if due care be not taken to use the manure sufficiently old and well neutralized, and deprived of its poisonous qualities, as acids, salts of iron, and all metallic substances, by the action of sun and air; with such care they will never run, as I have tried maiden soil, soil slightly manured, and the above soil from the ranunculus bed, manured with rape dust, and I never witnessed so strong and regular a bloom. I must also beg to differ from an old grower respecting the existence of those small worms which are not wire worms, but are generated in the bulb from disease or injury by frost or hail storms, and not from a disposition of adhering to good flowers more than bad, but owing to the finer sorts being more tender and delicate, consequently more liable to be attacked by disease, which may also be occasioned by a portion of fresh manure coming into immediate contact with the bulb; yet I believe frost, in nine cases out of ten, is the prevailing cause of disease, as one season I had nearly the whole of my bed injured by it more or less, and the whole of the injured bulbs were attacked by those small worms, and it was two years before I could recover them; many were completely destroyed in the ground, and others went off after being taken up. I this season had a bed lying east and west, which were all more or less injured by a severe hail storm in the latter part of April; whilst another north and south was not injured at all, though only a walk separated the two beds; the former on being taken up, were many of them nearly wholly destroyed by hundreds of those marauders, and I have not the least shadow of a doubt of their being attacked in consequence of their getting diseased by one or both of the above causes; and as a preventive I should recommend a net about half inch mash, to be thrown over the stage about the latter part of April, as we have for the last three years had severe storms of hail about this time, and suffer it to remain until it is necessary to put on the main covering; this will not injure the flowers or weaken them, but may prevent a severe loss. I should also recommend Tulipus to use a rich maiden loamy soil, the soil from his ranunculus bed, or if he does not grow them, to use the soil from his carnation pots. They may be grown in the loam one year, and the second year add one sixth dung from the cucumber bed, and one sixth coarse sand.

Hull, *June* 13, 1833.

ON THE MANAGEMENT OF ORCHARDS IN LANARKSHIRE.†

BY W. AITON, ESQ.

The modes of planting and managing fruit trees, have been variously conducted and understood by gardeners and orchardists, and many plans have been suggested for promoting their growth, and rendering them productive of fruit of an improved quality; but some of these plans have been found to be rather fanciful, and have been abandoned. Perceiving that all sorts of trees grow well in rich deep soil, some have not only heaped rich earth together, for fruit trees to grow on, but have laid flags, or formed causeways, under the trees, to prevent them extending their roots into the sub-soil. It has been stated in favour of these precautions, that, on digging up an ancient garden at Deer, it was found that a bed of rich earth had been laid to a considerable depth over the sub-soil, a causeway had been formed above that earth, a bed of sand, of a foot deep over the pavement, and into which the trees had been planted. This sort of preparation of the soil for fruit trees appears to have been done at a

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* From "Florist's Magazine."

† From "Quarterly Journal of Agriculture."

vast expense, to little purpose. The two causeways could do no good, as the roots of the trees would easily penetrate both of them, and enter the sub-soil in spite of all that costly preparation.

The intelligent orchardists in Lanarkshire, have acquired more correct knowledge in managing orchards, than the monks had prior to the reformation, so that their horticultural practices have required reformation, as well as their theological opinions. Some modern orchardists have indeed placed flat stones under fruit trees, to prevent as they conceived, the roots reaching the sub-soil; but it has always been found that the trees extended their roots over, around, and under the stones into the sub-soil. Others have dug pits, several feet in width and depth, and filled them with rich mould; But when such pits were dug in clay-land, they could not fail to be filled with water among the mould, and which the clay would retain, so as to injure the roots of the trees far more than if no such pits had been dug, and the trees had been allowed to follow their own course in extending their roots. It was on the same erroneous principle that mounds of rich earth were raised for fences, and the thorns planted upright, three or four feet above the surface of the ground, to prevent them striking root in the cold tilly sub-soil, which was imagined to be the cause of their becoming stunted in growth and covered with fog. The folly of attempting to prove either trees or thorns to grow *secundum artem*, is now seen in its proper point of view, and abandoned.

Some have recommended to dig or trench the ground which the fruit trees are to occupy about eighteen inches deep; but if the ground is nearly level, and the sub-soil retentive, the water in that case would remain about the roots of the trees and injure them. If trenching the ground be at all resorted to, it ought to be extended over the whole orchard ground. But if it is executed in a sterile clay-soil, resting on a tilly bottom, the better earth would be buried under a foot of barren sub-soil, which it would require much manure and labour to enrich; while the former soil being buried, would soon become inert. In bare clay-land, like that of the Clydesdale orchards, it is probably the best course to dig up the soil with spades, about ten inches deep, preserve it from being buried under barren earth, and enrich it as much as possible with manure, and occasional exposure to sun and frost to render it friable.

The orchardists in Lanarkshire have relinquished the practice of placing flags under the fruit trees, and they neither make pits, nor trench the ground eighteen inches deep, or more than ordinary delving with spades. They plant the trees only from six to eight inches deep, and raise the earth a foot or 18 inches round them, a few inches above their roots, to enable them to withstand the blast.

Considerable diversity of opinion prevails in Lanarkshire as to how far the fruit trees should stand from each other, and errors have been run into both in planting too near and too sparse. In the Dalziel orchards, and some others, the rows of trees are twenty-two feet apart, and eleven feet distance in the rows. The trees in the orchard at West Brownlee are closer. In the new orchard on the estate of Wishaw, the rows are at thirty feet distance, and fifteen feet from each other in the rows. On the Coltness estate, the rows are twenty-seven feet, and the trees ten and a-half feet from one another in the rows. Some, however, are sparser, and in some of the oldest orchards the trees are irregularly planted. In general, however, they are planted closer than is usually done in the English orchards. It is a common practice in the Clydesdale orchards to plant an early bearer, alternately with other trees in the rows; and some plant gooseberry and currant bushes between the trees; while others raise only potatoes, oats, &c.

In all the Lanarkshire orchards, every spring or damp ground is carefully drained, with either open or covered drains. But in all clay-land, a covered furrow drain ought to be formed between each row of trees. The great advantage of furrow-draining, in all heavy soils, is now universally admitted: and it seems more necessary in orchard ground than in arable land, as the trees overshadowing the ground create more damp than when the grain crops are taken; and as the roots of trees grow deeper into the earth than those of corn plants, draining in orchards is necessary to relieve the soil of all stagnant moisture. Young fruit trees require ropes of straw, or sprigs of broom, to be tied round them, to prevent their bark being eaten by hares. Either of these means are preferable to besmearing the trees with soot, or any other nasty substance.

After trees have been planted for five or six years, they ought to be divested of such branches as seem to point too near to the ground, and that rub upon one another, Some orchardists have attempted to train their fruit-trees, so as to send out branches in every direction, and to have the tree open in the middle. This method, however, is not in every case practicable with fruit-trees, and particularly in regard to pear-trees, which frequently tower high up in the top. It is a better, and still more common practice, to allow trees to take every one its own shape, and merely to lop off, with due caution, such branches as hang too near the ground; and they are not so much shaken by the wind as branches that soar higher. Wherever blotches appear on trees, they ought to be cut off to prevent their forming ulcers. All sorts of moss ought to be removed from fruit-trees, and the fruit should never be pulled from the trees when it is damp. It is better to take the fruit off with the hand than to shake the trees, which injures both them and the fruit. Those who purchase the fruit have the

trouble of taking it off the trees; but they do not always exercise sufficient caution to save the trees from injury.

The *produce* of the Clydesdale orchards, consisting of apples, pears, plums, and small fruit, has hitherto been disposed of as fruit for family use, or sold to retail dealers in Glasgow, Paisley, Hamilton, Lanark, &c.; and part of it has often been disposed of in Edinburgh. But now that the prices of apples and pears have fallen to less than one third part of what they brought about twenty years ago, and from the great expense of carting fruit to market, the orchardist would do well to consider if it could not be manufactured into cider and perry. It is well known that apples raised from a clay-soil make the best cider, and from the best information I have been able to procure, from twenty-four to thirty bushels of apples yield a hogshead, or one hundred and ten gallons of cider, the price of which varies from 1*l.* 5*s.* to 2*l.* 2*s.* per hogshead. In Herefordshire, twenty hogsheads of cider have often been made from the apples grown upon an English acre of land, although no more than forty trees grow on an acre. If a part of the fruit in Lanarkshire were converted into cider and perry, when the crops are most abundant, and only the marketable part of the crop, or what is known in Glasgow by the name of "shop fruit," were sold, a considerable sum might be raised by beverages, whilst the value of the marketable fruit might be kept at a remunerating price. Should the return from cider and perry fall short of the price the fruit brought some time ago in the Glasgow market, the expense of the carriage of the fruit at all events would be saved. I understand that the whole apparatus and utensils for making cider may be fitted up for about 50*l.*; and that two or three of these establishments would be sufficient to bruise one-half of the fruit that these orchards produce annually.

From the vast quantity of gooseberries and currants now raised in the Clydesdale orchards, and in every garden in that country, their prices have fallen to about one-half, or two-third parts of what they brought some years ago. But as immense quantities of them are now made into jam, jelly, and wine, as well as into tarts and other confectionary articles; condiments so wholesome and palatable cannot fail to be in high request among all ranks of people. These fruits, in fact, occupy the same place in Scotland that the vines do in warmer countries. Apples and pears are eaten in France and Belgium as food along with bread of rye; and in Cornwall and some parts of England, the labouring people eat fruit instead of bread or potatoes, and prefer the fruit to either of them.

Under crops of potatoes, oats, beans, barley, &c., are raised to a considerable extent among the fruit-trees in the Lanarkshire orchards, though not in that regular order as to be traced to any specific rotation of cropping. Potatoes with dung are generally followed by oats, and next by clover and rye grass. Where the trees are planted near to each other, the orchard small, and the ground steep, the ground is dug with spades for the under cropping; and even where the plough is used, three or four feet on each side of the trees are dug with the spade. to prevent the trapping of the horses injuring the trees. After the trees have grown twenty years, milch cows are sometimes allowed to browse in the orchards. But the ground requires to be broken up, manured, and cropped every few years, in order to enrich the soil, for the benefit of the fruit-trees, and to prevent their becoming stunted in growth and covered with moss. The tacksmen of the cottage orchards are bound in their leases to manure their orchards every four years. This is necessary in the sterile grounds on which many of these orchards have been formed, and especially when the trees are young. Even in richer land, the health and fecundity of the trees are promoted by under digging, and the application of manure. The under crops themselves far more than repay the dung and labour bestowed on the land.

ROYLE'S HIMALAYAN BOTANY.*

This is a splendid and interesting work on the botany of a district rich in the productions of natural history. The opportunities which the author enjoyed as superintendent of the Company's garden at Saharunpore, he employed in forming an extensive herbarium, and procuring all possible information on the subjects of his peculiar pursuits. The results are to be published in the work before us, which, however, being in parts, we have as yet only a small portion of what is to come. He commences with an introduction embracing a few necessary geographical details, among which our readers must be pleased with the following:—

"The plants of Kunawur have generally a dry sombre aspect, few leaves, and those small, frequently inserted in a cluster round the root, from the centre of which rises the scape of generally large and showy flowers. The petioles not under-

* "Illustrations of the Botany and other branches of the Natural History of the Himalayan Mountains, and of the Flora of Cashmere." By J. Forbes Royle, Esq., F.L.S. & G.S., M.R.A.S. Of the Honourable East India Company's Medical Establishment; Member of the Asiatic, Medical, Agricultural, and Horticultural Societies of Calcutta; and Late Superintendent of the Honourable Company's Botanic Garden at Saharunpore.

going decomposition, from the dryness of the climate, remain attached round the plant, and as they become pushed outwards by the growth of internal parts, the cellular parts are destroyed, while the fibrous remain, and protect the root, as with a covering of air, from the severity of the weather. One peculiarity is remarkable, and that is, the resemblance externally between the plants and this cold region and those of the desert-like country near Delhi; but this is observable only in the parts of vegetation, and not in those of fructification, for in the cold climate, the flowers are large and showy, and in the hot, small and inconspicuous: in both the shrubs are stunted, thorny, and frequently hairy; the wood scanty, hard, and compact; while the surface of each is dry, and of an ash grey or pale green colour. The only similarity in climate is, that in each there is great dryness of the atmosphere; the the resemblance therefore is probably dependent on peculiarity of the transpiratory surface. *Capparis* and *Salsola* are almost the only genera common to both situations; the latter evidently owing to the soil of each being covered with saline efflorescence."

We are much pleased with general remarks of this description, and wish we could more frequently see them introduced in works on botany, though it is not always to be expected that a mere collector of specimens or a Jussieuan botanist, eagerly dissecting fruit and flowers to detect fanciful analogies running through what he terms families and orders, can either have leisure or tact for this purpose, warped, as all his thoughts must be, by the influence of a theory. We are glad to give another specimen of the matter of which we cordially approve, before we come to what is objectionable.

"If," says Mr. Royle, "instead of keeping on mountain tops, we descend into the vallies on their northern face, we shall observe that, with many of the phenomena peculiar to such localities, there is considerable modification in the vegetation of each, according to elevation and latitude. The valley of Cashmere, situated between the thirty-fourth and thirty-fifth parallels of latitude, in the most northern part of Himalaya, and to which we descend to the snow-clad summit of Peerpunjal, is described as being of an oval form, encircled by mountains clothed with vegetation, which are themselves girded by a higher range covered with snow. The level of the valley is of considerable extent, being about sixty miles in length, and about forty in breadth in the widest part; its elevation is estimated by the late lamented traveller, M. Jacquemont, to be from 5,248 5,576; he however states that the beauty of this valley has been much exaggerated, both by his countryman Bernier and by Mr. Forster. But there is no doubt that, in consequence of its being copiously watered by numerous streams, lakes, and canals, there is considerable moisture both of soil and climate, and almost constant verdure; while the numerous gardens, and the great variety of fruit-trees and of beautiful flowers, must always strike visitors from the arid plains of India, whether Europeans, as Bernier and Forster, or Asiatics, as Abul Fuzl. From the mixed nature of the cultivation, the climate must evidently be mild and temperate, for even in the warmest months of summer the breezes which descend at night from the mountains are always cool and pleasant; the periodical rains consist of gentle showers, and the snows which fall in winter cannot remain long upon the ground. Abul Fuzl says, that it rains and snows here at the same season, as in Tartary and Persia; and that during the periodical rains in Hindoostan light showers only fall here, though with great violence on the mountains which form the barrier to the south-east.

"From the northern latitude and great elevation of the valley of Cashmere, we are not surprised at finding in its flora a great resemblance to that of European countries; but the moisture of the climate, and its mild temperature in the season of vegetation, causes so great an extension of the herbaceous parts, as well as of the flowers of plants, that many of them rival in luxuriance those of tropical countries. The mildness and moisture of the climate is indicated by the extensive cultivation of rice, as well as by the successful cultivation of the *Cucurbitaceæ*, as no where are there finer and larger melons, water-melons, gourds, and cucumbers. The kidney bean, though not common in the gardens of the north-western provinces, thrives remarkably well in Cashmere, as well as the egg-plant and the capsicum, The lakes abound with *Trophis bispinosa*, and species of *Nymphæa Menyanthes*. The existence of hemp and of species of balsam, of marsh-tree, and common mallow, all indicate a temperate climate, as do the cultivation of wheat, barley, and saffron, together with the culture in their gardens of such European vegetables as turnip, radish, beet-root, and cabbage; and the usage of clover as fodder for cattle; all proving the approximation in vegeta tion to that of European countries, as has been already indicated with regard to the climate by the testimony of so many travellers. The other genera of which species have been brought down by the plant collectors are chiefly European, as *Viola, Trollius, Dianthus, Mathiola, Cheiranthus, Draba, Capsella, Hypericum, Lythrum, Spiræa, Rubus, Geum, Myricaria, Eryngium, Euphrasia, Salvia, Nepeta, Phlomis, Trifolium, Vicia, Orobus, Ononis, Medicago, Lactuca, Sonchus, Iris, Narcissus*, and *Crocus*. The species which have been already identified with those of Europe are the following: *Mentha viridis, Mentha arvensis, Mentha sylvestris, Hibiscus Trionum, Centaurea moschata, Hieracium sabaudum, Dianthus barbatus, Lychnis coronaria, Myosotis palustris, Dactylis glomerata, Cucubalus baccifer*."

We now turn to the body of the work, which

contains a detailed account of the Jussieuan family, RANUNCULACEÆ, which, though in some respects it is done in a masterly manner, contains a very erroneous and withal a highly dangerous doctrine, namely, that the plants arranged in a family like the *Ranunculaceæ* possess "the same sensible properties and modes of action on the human frame" (page 45), a doctrine which, as we shall presently see, is contradicted by the author's own details; but before coming to these we shall stop for a moment to examine what Dr. Professor Lindley says on the subject—the doctor being esteemed among his *clique* the great oracle upon such absurd dreams and fancies. The doctor, when engaged for the Bayswater book manufactory, got up some sad contradictory stuff for the *Encyclopædia of Plants*, of which, we doubt not, he has long been ashamed; but there it is in good stereotype print. At page 1052 of this work, Dr. Professor Lindley tells us, that when the natural order of a plant is ascertained (we quote from the Editor's *Alphabet of Botany*) many of its most important qualities, such as "medicinal properties," may be "safely" inferred. Now, if this were so, nobody, I think, would dispute the high value of this *Natural* system. Unfortunately, however, this principle is virtually contradicted by what follows. Thus, under CELLULARES, Order viii., Dr. Professor Lindley gives us "*Cetraria Islandica*, &c., tonic and nutritive," along with "*Evernia vulpina*, poisonous." Under VASCULARES, again, Order cxli., (to say nothing as to size, form, and structure,) of "the fig, the mulberry, and the bread-fruit tree" being *naturally* (common sense would say unnaturally) classed "among worthless weeds," such as "the common stinging nettle," "and shabby half herbaceous shrubs," such as "the hemp and the hop;" what are we to think of "safely" inferring from the fig, the bread-fruit tree, and the sago plant, the "medicinal properties" of "the upas tree, now known to be the *Antiaris toxicaria*," the inspissated juice of which, to use Dr. Professor Lindley's own words, "is a frightful poison" (p. 1083)? Were I the proprietor of this work, I would not hesitate an instant to break up the the stereotype plates, in order to expunge such glaring contradictions and highly dangerous errors. In his own work on the *Natural System*, Dr. Professor Lindley alludes to the discrepancy in these words: "The fig, the bread-fruit tree, the jack, and the mulberry, are all found here, and are a curious instance of wholesome or harmless plants in an order which contains the most deadly poison in the world, the Upas of Java; the juice, however, of even those which have wholesome fruit, is acrid and suspicious, and in a species of fig, *Ficus toxicaria*, is absolutely venomous."* Now had the author not been blindly prejudiced in favour of the system, he must have seen that instead of this being a "curious instance," authorising a theoretical suspicion of the mild fig, and nutritious bread fruit, is fatal to the whole doctrine of "safely" inferring medicinal properties. Dr. Lindley complains bitterly in his preface, that "the *Natural System* of Botany" has to contend with a great deal of deeply rooted prejudice;" but the wonder ought rather to be that such doctrines as those under notice ever found any person so foolhardy as to promulgate and defend them.

In the division just alluded to, which is the fifteenth class of our ALPHABET, in the second order, among those especially called the *true* nettles (as if there could be in nature any false ones), we find the mulberry tree, side by side, with the stiff hemp and the light climbing hop. Now admitting that the seed and the flowers of all these agree in structure, as they nearly do, it must appear obvious that the plants are as incongruously and unnaturally grouped as possible, in reference to their general form and habits; while, if we look to qualities, what can be more incongruous than to rank the poisonous upas of Java in the same order with the fig? In the seventh order of the eighth class, also, we find the wholesome potatoe and the mild shepherd's club ranking with henbane and the deadly night-shade. In the third order of the eleventh class, we find not only lofty trees ranked with dwarf shrubs, and tiny slender herbs, but we have the coffee ranked with the well-known emetic, ipecacuanha, and this again with Peruvian bark. In the thirteenth class we have, so far as size and form are concerned, the low-growing pinks, violets, and buttercups, ranked not only with the tall sun-flower, but with the stately horse-chestnut, the lime-tree, and the maple; and these again with the climbing vine, and the waving barberry shrub; while we could not, I think, "safely" infer the "medicinal properties" of the poppy, from which opium and laudanum are procured, gamboge, which is violently purgative, and buttercup, which is an acrid poison, from the mild cocoa and marsh-mallow, and the wholesome orange. This would indeed be altogether preposterous. The fourteenth class furnishes precisely similar discrepancies. In point of size and form, we find the spring chickweed, one of our smallest British plants, ranked among apple-trees and holm oaks; and these again with the light climbing passion flower and gooseberry bushes. The "medicinal properties," however, of the poisonous elaterium, the acrid stonecrop, the emetic laburnum, and the purgative buckthorn, could not be "safely" inferred from the nutritive pea and bean, or the wholsome pear, apple, and gooseberry,—which are all in this class.

I could readily fill a volume with the similar discrepancies of this so preposterously belauded *Natural System*, which, if it have not to answer for the loss of human lives by poisoning upon principle, it

* P. 95. "Lindley's Natural System of Botany."

is no fault of its promulgators. The fact is, that so far from being more natural than the Linnæan system, these instances now given, with many more, show it to be more palpably unnatural. But the day of philosophy has now, as I fondly hope, at last dawned, and rational and useful studies must ultimately banish mystery and nonsense, though these may, for a season, stalk about in the mask and under the assumed names of philosophy and science.

So far from the Editor's *Alphabet of Botany:* let us now turn to Mr. Royle's book, in which, as we have seen, these highly pernicious doctrines are advocated, though expressly contradicted by the statements which the author himself furnishes in their support.

"The *Ranunculaceæ* form a very natural family, not only with respect to structure and geographical distribution, but also in *possessing the same sensible properties and modes of action on the human frame.* This is owing to their containing in all parts an acrid principle, which Krapf ascertained to be neither acid nor alkaline, but of so volatile a nature, that in most cases simple drying in the air, or infusion, or decoction in water, is sufficient to destroy it; that its activity is increased by acids, sugar, honey, wine, and spirits, and is only effectually destroyed by water and vegetable acids. (*Fée, Cours. d'Hist. Nat. Pharm.* v. i. p. 373.) Two vegetable alkalies, *Delpia* and *Aconitia*, the latter little known, are produced by the plants of this family; if the acrid principle be always of the volatile nature that it is represented, the powerful effects attendant on the administration of the root of *Aconitum ferox* even after it had been preserved ten years, must be ascribed to the presence of some principle of a more permanent nature. According, apparently, to the proportion of the acrid principle to the rest of the vegetable substance, or perhaps owing to the peculiar nature of the acrid principle in each species, it is found that they act either on the system generally, or in different degrees on particular organs. Thus several species of *Ranunculus* are used as rubefacients and vesicatories; while the roots of *Zanthorhiza, Coptis,* and *Hydrastis,* as tonics; and those of *Thalictrum majus* as a substitute for rhubarb. *Hellebore* has long been known as a powerful cathartic, and *Aconite* as a no less powerful narcotic and poison; while some, from the destructibleness of their noxious property by water, have been used as food. The Mahomedan physicians in India having derived their knowledge of drugs chiefly from Arabian authors, who translated from the Greek, it is surprising to find such articles as *Hellebore, Pœony, Lycoctonum,* and *Stavesacre*, all of which, as well as others, might be grown in the Himalayas, prescribed in every part of India, though the druggists, calculating upon the ignorance of both practitioners and patients respecting the true drug, generally substitute some which they consider an equivalent. Yet it is interesting to observe, that independent observation has introduced into Indian practice several drugs from this family, to which the same properties are ascribed as in Europe. Thus *Ranunculus sceleratus* is used as a vesicatory. The roots of *Thalictrum foliolosum* as a bitter in the cure of fevers—those of *Aconitum heterophyllum* as a tonic, and of *Aconitum ferox,* though a poison, as a narcotic in rheumatism. *Nigella sativa* is alone cultivated in India, as in most eastern countries, and continues in the present day, as in the most ancient times, to be used both as a condiment and a medicine."

Now, how does it prove the doctrine of all these plants, huddled up by Jussieuan botanists, into what they call a family "possessing the same sensible properties and modes of action on the human frame," to tell us that some of them are used to *blister* the skin, others as *tonics;* others as strongly *purgative;* others as *narcotic poisons;* others as *bitters* in the cure of fevers; others as substitutes for rhubarb, a mild *aperient;* others as *condiments*, &c.? It is indeed, nearly, though not quite so bad as the gross contradictions of Dr. Professor Lindley; for here, as in his case, of the common and the poison fig, we have Mr. Royle telling us that one species *(Aconitum heterophyllum)* is "a tonic," and another species of the same genus *(A. ferox)*, a "virulent poison," the terrible drug which the Hindoos call *Bitch* or *Bish.* This is, of course, a great deal worse, because of the dangers it may lead to, than that of classing the tall, climbing, graceful shrubs, in the genus *Clematis*, or Virgin's Bower, with such minute marsh plants as *Ranunculus hederaceus*, and these again with the gaudy peony and the plain meadow rue, calling the whole a "a very natural family." It would appear, from this latter phrase, that there are other families in the so called *natural system*, which are not so "very natural:" if they are more discrepant than this, they must be bad enough in all conscience.

We shall, in order to give Mr. Royle all fair play in his "Illustrations of the Natural System," make one other extract from his account of what is certainly a more natural family, if for once we may borrow this highly objectionable phrase. Our extract shall be from the Cruciferæ.

"The *Cruciferæ* are, like the *Ranunculaceæ*, an [*a*] European family, of which few are found in the plains of India, but numerous species in the Himalayan Mountains. These belong chiefly to genera which are common in Europe and the northern parts of Asia and America, and of which several new species have been described in the Floras of Siberia, Caucasus, and of the Altai Mountains. The species hitherto discovered are about 70 in number, belonging to the genera *Nasturtium, Barbarea, Turritis, Arabis, Cardamine, Dentaria, Draba, Thlaspi, Hesperis, Sisymbrium, Alliaria, Erysimum, Lepidium, Capsella, Sinapis?* The latter, mentioned with doubt, as the only species known, are those described in the

Flora Indica, obtained by Dr. Buchanan from Tibet. The genus *Tauscheria*, which, from its singular fruit, I had named *Navicularia,* is the only one of the peculiar Siberian genera which extends to Kunawur, where the arid and saline nature of the soil must be as favourable to its growth, as the deserts of the Kirghis, or the banks of the Irtisch. The European species of the above genera, which have been found extending as far southward as the Himalayas, are, *Turritis glabra, Thlaspi arvense, Capsella Bursa Pastoris, Alliaria officinalis,* and *Sisymbrium Sophia.* Besides *Tauscheria desertorum, Crambe cordifolia,* is another plant belonging to the Flora of Siberia, as well as to that of Caucasus, which extends to Kunawur. *Draba radicans* of the present work, with its radicating stems and yellow flowers, is closely allied in general appearance to *Draba repens,* figured by Ledebour, t. 145. The other species of the same genus are closely allied in habit to their European congeners, and equally inhabiting, like them, the cold and exposed summits of mountains.

" In the gardens of Northern India, *Mathiola incana* and *Cheiranthus cheiri* are common; and as I have received specimens of both plants from Cashmere, there is no doubt that both have been introduced from that direction into India, being still much used in medicine, and known by the names of white, purple, and yellow *khuerce*, or, as commonly written, *cheiri.* In the plains of India, but few species of this family are met with. *Nasturtium officinale*, growing in the vicinity of water in most parts of the world, seems to be found in all parts of India, though the natives ascribe its introduction to the English. I have found it near Hurdwar; Dr. Wallich met with it in Rohilcund. *Lepidium sativum* belonging to a genus, of which species are found in Syria, Arabia, and Persia, has long been known and cultivated in India. From the medicinal and dietetic uses, as well as from the Arabic and Persian synonymes of this plant, it is probable that it was introduced into India from Caubul or Persia, where also we must look for the route by which the cabbage, radish, and turnip, have found their way into India, as all were known and cultivated there long before they could have been introduced by Europeans, I have received the seeds of all from Cashmere, and grown them in the Botanic Garden of Saharunpore. The turnips, moreover, in Kunawur, are described as being remarkably fine. Besides these, which are confined to gardens or the neighbourhood of villages, there are other species of this family, which form very extensive agricultural crops, but, like the former, only during the cold weather months. The majority of these have been referred to the genus *Sinapis*, and one species, which agrees very closely with *Brassica erucastrum* to both *Brassica* and *Eruca;* this is called *tira :* a variety apparently of the same is cultivated in the hills. The species or varieties referred to *Sinapis* still require careful revision. *Sinapis ramosa* of Dr. Roxburgh appears to be the species which is called *raee*, Indian mustard, and is much used as a condiment, *S. glauca* may be the *toria*, *S. dichotoma* the *kalee-surson*, and *S. juncea* the *bunga-surson;* the three latter, as well as *tira* and *Sesamum orientale*, being extensively cultivated for the oil which is afforded by their seeds, as the natives of the greater part of India depend upon them chiefly for oil for burning in lamps, as well as for that necessary for dietetical purposes. Some other species are described as being indigenous to and growing wild in India; but regarding all there is some uncertainty, and though there is no doubt that the cultivated species have been long acclimated, yet having only been met with in that state, their native country must still be considered undetermined. But though there is this uncertainty respecting the cultivated *Cruciferæ*, species of this family are no doubt found in the plains of India: of this a curious instance is the existence of a species of *Farsetia*, in the neighbourhood of Delhi and Agra, where it was first found by Dr. Hamilton, and subsequently by myself in the same locality. The existence of the species of this genus only in Syria, Egypt, and north of India, may be considered as confirmatory of the opinion stated, p. 7, that the Oriental or Persian, or better, as Professor Lindley calls it, the *Syrian region*, may be considered as extending to the north of India. Another plant more singular was also first discovered by Dr. Hamilton, *Cochlearia flava*, and has been described by Roth under the name of *Alyssum Cochlearioides* which the celebrated De Candolle has called *Cochlearia? Alyssoides*, in his Prodromus, with a query, whether it be not a species of *Vesicaria.* In its accumbent cotyledons, oval dissepiment and convex valves, it resembles *Cochlearia*, but it differs in habit, which, with the peculiar rounded form of its silicule, long funiculus, yellow flowers, and Indian locality, might entitle it to form a new genus. It is found all along the banks of the Ganges, in Northern India, as high as Hurdwar.

" The *Cruciferæ*, one of the most natural of families, presents also the most perfect analogies in respect to sensible and medical properties. Most of the species, though of course in different proportions, contain an acrid volatile oil, which renders the Indian, as well as the European species, useful as stimulants and vesicatories, a fixed oil in their seeds, for which many of them are cultivated, together with azote, fecula, mucilage, and saccharine matter. When the acrid principle is small, in proportion to the mucilaginous or saccharine matter, many of the *Cruciferæ* become, as is well known, useful articles of diet."

We hope Mr. Royle will take our strictures in good part, and will take care, as he proceeds, to avoid contradictions. We shall probably return to the work in a future page.

DESCRIPTION OF THE PLATES.

CONVOLVULUS TURPETHUM.

Foliis cordatis angulatis integrisque obtusiusculis mucronatis pubescentibus, pedunculis folio brevioribus, bracteis 2 magnis tubum corolla fere æquantibus, caule alato.

Convolvulus Turpethum. *Linn. Sp. Pl. p.* 221. *Willd. Sp. Pl, v.* 1. *p.* 859. *Roxb. Fl. Ind. v.* 2, *p.* 57. *Spreng. Syst. Veget.* v. 1, p. 598.

Shevadia Kodie.

Stems twining or procumbent, according to circumstances, with three wings, smooth. *Wings* decurrent from the petioles. *Petioles* flattened above, and slightly winged on the edges, pubescent, about $1\frac{1}{2}$ inches long. Leaves broadly suborbicular, cordate, entire, obtuse, softly pubescent; above a little harsh, from the hairs being shorter and stiffer. *Peduncles* axillary, round, pubescent, varying in length, but usually longer than the petioles: at first two or three-flowered, but afterwards increasing in number, owing to the lateral predicels becoming proliferous and giving off fresh ones. *Bracteas* large, membranaceous, deciduous. *Calyx* five-parted, outer segments much larger than the others, concave, entire, villous, mucronate, speckled within with numerous black spots. *Corolla* white: *tube* short, contracted at, and nearly closed by, the filaments, which are much enlarged and hairy. *Filaments* short: *anthers* oblong, spirally twisted after shedding their pollen. *Style* filiform, longer than the stamens. *Stigma* capitate, two-lobed. *Capsules* stipitate, two-celled, four-seeded, enclosed in the greatly enlarged, and now smooth greenish white *calyx*. In its junior state the apex is covered with a green scale, which drops as it approaches to maturity, leaving the capsule transparent in the place it occupied.

OXALIS RUBELLA.

Decandria Pentagynia, Linn; Oxalideæ, Jussieu.

Cal. 5-phyllus. *Petala* ungmibus connexa. *Stam.* inaequalia, 5-breviora exteriora basi connata. *Caps.* angulæ dehiscens, 5-gona.

Oxalis rubella; caule ramosa folioso erecto, pedunculo unifloro foliis multoties longiore foliis ternatis, subsessilibus lineari cuneiformibus, corollis campanulatis obtusis stylis staminibus interioribus brediaribus.—*Willd. Sp. Pl.* 2 *p.* 796.

Oxalis rubella; corollis campanulatis, stylis intermediis, filamentis edentulis.—*Jacq. Collect.* 3 *p.* 232. *Je. Rar.* 3 *t.* 471.

Oxalis radia fibrosa, caulibus ramosis, foliis ternatis angustis, florum petiolis longissimis.—*Burn. Afr.* 71. *t.* 28. *f.* 2.

Oxalis hirta, O. rosacea, and *O. rubella,* are very much alike; perhaps too much so to be properly considered as distinct species. If they are to be distinguished, this plant, having obtuse petals, must be referred to the last mentioned. It is a native of the Cape, and requires the shelter of a green-house, and is propagated by tubers.

MORÆA COLLINA.

Triandria Monogynia, Linn.; Liliaceæ, Jussieu.

Moræa collina (multiflora; cor. uniformis; imberbis;) foliis linearibus, convoluto-concavis, nudis; corollæ laciniis subæqualibus, sursum recurvo-patentibus, deorsum turbinatim conniventibus, elliptico oblongis subacutis, extimis basi scrobiculo mellifero notatis; stigmatibus miminuto petaliformibus; filamento cylindraceo, columellari, pubescente.

Moræa collina. Thunb. Diss. 11. *n.* 18. *Prod.* 9. *Jacq. Je. Rar.* 2. *t.* 220. *Fragm.* 14. *n.* 51.

Moræa miniata. Bot. Repos. tab. 404.

Sisyrinchium collinum. Cavan. Diss. b. 346. *Willd. Sp. Pl.* 3. 578.

(*a*) flore miniato, minore.—*Bot. Repos. b. c.*

(*b*) flore subminiato, majore.

(*c*) flore lutescente.—*Jacq. l. c.*

Root, a roundish bulb-tuber, covered with fibrous coats; *leaves* in the fertile plant generally cauline, 2-3, in the sterile plant one, radical linear-lorate, narrow, far attenuated, caudate-cuspidate convolute-concave, naked lower on reaching far above the stem, upper shorter; *stem* one or paniculately many fascicled; *fascicles* 2-3 flowered, convolute lanceolate, awned-acuminate; *corolla* ephemeral regular, upwards uniformly, and recurvedly patent, downwards turbinately converging; *segments* of the same length, exterior ones, elliptic oblong, interior oblong, narrower; ungues broad, nearly the length of the laminæ, outer having at the base a small oblong melliferous indentation; *filament* columnar cylindric, entire, pubescent, about the height of the ungues; *anthers* linear-oblong, sessile, upright, addressed to the stigmas, than which they are very little shorter; *stigmas* subpetaloid, bilabiate, barely higher than the ungues; inner lip bifid, with subulate segments, but just longer than the outer, which is the broadest, retusely truncate ciliate, fringed pubescent inward; capsule membranous, columnar slender, indistinctly trigonal, about an inch long.

A native of the Cape of Good Hope: it was imported by Messrs. Lee and Kennedy. It blooms in May, and is a green-house plant.

RANUNCULUS POLYPETALUS.

Polyandria Polygynia, Linn.; Ranunculaceæ, Jussieu.

R. Polypetalus scapo unifloro, foliis reniformibus crenatis calyceque glabris, petalis oblongis numerosis. Species distinctissima, ad Ficariam accidens. *Herba* perennis, cæspitosa, rudimentis foliorum emarcidorum suprà tecta. *Radix* fibrosa, fusca. *Scapi* erecti, filiformes, glabri, uniflori, semi v. pollicares. *Folia* petiolata, reniformi-cordata, crenata, glabra, 3 v. 4-lineas lata: *dentibus* 7-10, magnis, obtusissimis. *Petioli* glabri, semiunciales. *Calycis foliola* 5, elliptica, obtusa, subcoriacea, glabra, persistentia. *Petala* 10 v. 15, spathulato-oblonga, obtusa, flava, calyce longiora, 3 v. 5-nervia, basi angustata, poro tubuloso esquamato aucta. *Stamina* duplici ordine numerosa: *filamenta* dilatata: *antheræ* subrotundæ. *Torus* sphæricus. *Carpella* compressa, glabra: *rostra* subulato, recto, elongato.

This new and very distinct species has been found on the peak of Kedarkanta, in the East Indies, enamelling the ground with its rich yellow flowers immediately on the melting of the snow.

VIOLA KUNUWARENSIS.

Pentandria Monogynia, LINNÆUS; Violaceæ, JUSSIEU.

Calycis sepala inæqualia: petala inæqualia, æstivatione convoluta; stamina nec coalita; filamenta basi dilatata, antheras demissas gerentia; ovarium nunc superum, nunc semi-inferum; valvulæ capsulæ elasticæ.

This is a very pretty, though not a very showy, species, the flowers being rather small and inconspicuous, though their colour is clear and uniform. It has somewhat the habit of *V. canina*, though more leafy, the leaves being oblong, bluntly pointed, and slightly waved on the edges. The flower stalk has a pair of flower scales (*bracteæ*) a little below the blossom. The five divisions of the corolla are more equal than in *V. odorata*, or *V. tricolor*.

CORYDALIS CASHMERIANA.

Diadelphia Hexandria, LINN.; Fumariaceæ, JUSSIEU.

C. Cashmeriana; caule simplicissimo erecto, foliis caulinis subsessilibus pinnatisectis, segmentis lineari-lanceolatis integris rarissime subdentatis, terminali cuneato trilobato, racemo coarctato paucifloro, bracteis foliaceis, summis integris 3-dentatis, calcare pedicello breviore obtuso incurvo.—*Corollæ* petala externa cærulea, inferiora rotundato-ovata, unguiculata. *Petala interiora* ungnibus flavis, limbis purpureis.

This beautiful plant has been as yet only found in Cashmere.

ANEMONE DISCOLOR.

Polyandria Polygynia, LINN.; Ranunculaceæ, JUSSIEU.

A. Discolor; scapo unifloro maculato foliis 3 v. 5-partitis sericeo-villosissimis, lobis obtuse inciso-serratis cuneato-ovatis, involucris triphyllis sessilibus, foliolis cuneatis lobatis dentatis, sepalis 7 ovalibus extus pilosis, intus glabris, ovariis ovatis hirsutis.

The *root* is fusiform, and appears thicker than it actually is, in consequence of being surrounded by the sheathing bases of the petioles of former years, which as happens in many other plants of the Himalayas and of Kunawur, remain undecomposed, and protect the root from the inclemencies of the seasons. The *radical leaves* form a spreading tuft the *petioles* are broad, sheathing, membranous at the base, and parallel-veined; the *leaf*, auriculate, acuminate, 3 or 5-lobed, lobes frequently subtrifid oblong-cuneate, coarsely serrate, villose, soft and velvety. The *involucrum* composed of 3 sessile leaflets, which are entire and dentate, or 3-lobed, with the lobes oblong linear 3-dentate. The *scape* is erect or ascending, round, striated, frequently spotted, hairy. *Pedicels* either single or double, in the former case equal in length to the involucrum during æstivation, afterwards twice or thrice as long; where there are two flowers, one is nearly sessile, the other long pedicelled, with frequently a two-leafed involucel. The flowers are erect. The *sepals*, generally seven in number, imbricate, obovate, three times as long as the stamens, varying in colour from white on the upper, and blue on the lower surface, to entire blue, and even to a livid hue. The *stamens*, with broad filaments tapering towards the apex. The *ovary* ovate, oblong, and very hairy.

This species of Anemone, is chiefly found on the tops of lofty mountains in the Himalaya.

SCILLA AMÆNA VAR. β.

Hexandria Monogynia, LINN.; Liliaceæ, JUSSIEU.

Scilla amæna; foliis pluribus, extimis oblongo-ligulatis, obtusis cum mucrone, medio nervosis; scapis pluribus, varie compressis, nervoso striatis racemo distante; bracteis minutis, solitariis corolla rotate; filamentis ea duplo brevioribus, subulatis, planis, hypogynis, mis laciniis, et mutuo inter se cohærentibus æqualibus; germine oblongo ovato tritoroso, nec in stylum rostratum abeunte.

Scilla amæna.

(α) racemo 7 multi-floro; flore saturate cyaneo; filamentis sursum coloratis; antheris atro-cyaneis.

(β) racemo 1—4 floro; corolla cærulea; filamentis pallescentibus; antheris subæruginosis.

Scilla sibirica.—Bot. Repos. tab. 365.

Scilla præcox.—Donn. Cat. Hort. Cant? Nec ea *Willd. Sp. Pl.* 2 28; quæ, ipso monente, mera *bifoliæ* varietas.—*Vid. Schrader Journ. fur die Bot.* 1799, *vol.* i. *p.* 287.

Bulb tunicate, about the size of the walnut; *leaves* about four, ambient, convolutely conduplicate downwards, from upright recurvedly recumbent, outer broadest, oblong ligulate, slightly concave, nerved obtuse, with a somewhat glandular point; *scapes* within these, than which they are shorter, several, variously compressed, striated, far-attenuated, upright; *flowers* spikedly racemose, rather distant, nodding; *pedicles*, shorter than these; *bractes* minute, membranous, far shorter than pedicles; *corolla* hexapetalously parted, campanulately rotate; contracted at the base, segments oblong, pointed; *filaments* about half their length, flat, subulately attenuated; membranous, equal, divergent, cohering at their bases among themselves, and with their corolla; *anthers* ovate, sagittate incumbent; *germen* pale, ovate, tripulvinate, trisulcate, uneven; *style*, about the length of this, erect, filiform; *stigma* a terminal point, inconspicuous above the anthers.

The plant blooms in March, and is hardy and scentless.

GREWIA ELASTICA.

(Pl. 28. Fig. 6.)

Polyandria Monogynia, LINN.; Tiliaceæ, JUSSIEU.

Calyx 5-sepalus coriaceus nitus coloratus. Pet. 5, basi intus glandulosa aut squamulosa, imo toro stipitiformi inserta. Stam. ∞ ex apice. tori orta, libera, antheris subrotundis. Stylus 1. Stigma 4-lobum. Drupa 4-loba, 4-pyrena aut abortu 2—3-pyr. Nuces biloculares, 2-spermæ, aut abortes 1-spermæ. Embryo erectus.

Blossom yellowish, with rather small petals, strap shaped and pointed; buds, ash grey, as are the flower stalks; fruit two celled and purplish, crowned with the persistent pistil; leaves alternate, dark green above, hoary underneath, saw toothed, on short foot stalks, with minute leaf scales at the base, somewhat egg-oblong, but terminating in an acuminated point

1. Ribes sanguineum.

2. Boronia pinnata.

3. Boronia serrulata.

1. Sprengelia incarnata.

5. Westringia rosmarinifolia

6. Wistaria frutescens.

7 Gentiana cruciata

8 Geranium Lancastriense

MR. CONDUCTOR LOUDON ON THE EDUCATION OF GARDENERS.

BY CHRISTOPHER NORTH ESQ., OF BUCHANNAN LODGE.*

We have often wondered that nobody has hitherto taken the trouble to unmask the shameless wholesale plagiarisms, the vulgar and filthy language, and the utter ignorance and presumption which issue from the book manufactory of Bayswater, and pollute the taste, and unhinge the principles, religious, moral, and political of gardeners and others, who unthinkingly drink their poison. What other could be expected from an avowed subscriber to support Carlisle of Fleet-street? We were ourselves preparing a list of Bayswater plagiarisms, but found that even a modicum thereof would occupy some thousand or so of our pages, when we had the pleasure to see the cudgel in far more stalwart hands than our own, and the redoubted demolisher of of literary pretenders mauling the "clipper" about with his terrible crutch, till the very shears dinled in the clipper's hands, and the poor belaboured body would have been fain to clip out all he had ever cribbed, and leave nothing but the lank fleshless skeleton to escape from the deadly floorers that came rattling on his patchwork gaberdine as thick as hailstones, from that fearsome and fearless castigator, Christopher North. We should not be doing our duty to our readers did we overlook the wholesome and manly exposure of the doings in king-making, match-making, and fiddler-making of Mr. Conductor Loudon. All readers of course read Blackwood—the magazine of magazines, the touch-me-if-you-dare with its *chevaux de frise* of thistles, and all gardeners and botanists will read this paper which so nearly concerns them; but lest any by any chance—the merest accident in the world, should not see the May Maga, we here place a part of it—the drops before the shower—the cuff preliminary—the smack initiative—the cut prefatorial—the hit introductory—the gowf prelusive—the blype by way of beginning—the touch of the knout to tickle the creature into flagellatory trim—the taste indicative of the trouncing that is to follow—the fugé thump before the awful set-to—the slogan before the onslaught—the pawing play of the lion before the death-pounce—the hail-stone before the the thunderbolt—in the front of our number—the shower—the set-to—the onslaught—the death-pounce itself in our next—together with a little bit of a tail-piece to be entitled "Bayswater Libel on the Works of Creation," from the Encyclopædia of Plants, supposed to be from the pen of Dr. Professor Lindley. When time does not press, we may possibly glance at Mr. Conductor Loudon's doings in spoiling landscapes in Oxfordshire and elsewhere. It would be sacrilege to omit North's *opening: Sit omnibus silentium ibi! Cavete et tacite, Denson et Lindley!!* North himself, in all his glory, thus begins:

We have all our lives envied Adam. Yet, would you believe it, not for his abode in Paradise. The soul cannot now conceive a perfectly sinless and perfectly happy state of being; and a mere name, and no more, to our ear is the garden of Eden—ere was plucked

"That forbidden fruit, whose mortal taste
Brought death into the world and all our woe."

Our first parents are not felt to be our first parents till they are fallen; then it is that we indeed love them; our filial affection is made tender by pity, and awful by fear, and we weep to think of them, as they,

"Hand in hand, and slow
Through Eden took their solitary way."

It was original sin that made this earth so beautiful—that gave it a beauty dashed and broken with tears. Look long at a rose bush covered with lapsing dew drops, and you grow sorrowful—full of sorrow. If there were not the consciousness of some great loss, and the presage of some great restoration, a sight so simple in its purity could not so profoundly move the spirit, as that its confessions should be a prayer. Not surely in form and colour alone lies the beauty of the rainbow.

We envy Adam because he was driven from our Paradise. For a while the earth for him and poor Eve brought forth but thorns, so is it writ. But as the wind blew from Paradise, it brought seeds that sowed themselves in the desert, till ere long the desert blossomed like the rose. Assisted by younger hands, Adam could afford to steal an hour or two as the sun was westering, from the toil of field tillage, and through the twilight, and sometimes well on into the night, would he and Eve, not unregarded by the stars, work by their two selves, shaping bowers, and arbours, and glades, so as to form, by a model imperishable in their memories another small new garden of Eden—not indeed so delightful, but dearer, far dearer to their souls, because every leaf was tinted by grief. Melancholy names did they give then to the thoughtless plants and flowers, and they loved them the better, that henceforth they reminded them always, but not painfully of their transgression, now suffering a punishment so softened, that it sometimes was felt to be a chastened peace. Their hill side garden sloped to a stream, that no doubt was a branch of the holy river, of which the blind seer sings, "southward through Eden went a river large." We see the vision now, but we fear to paint it. Eve is still in her mortal shrine: and as for Adam, not Seth's self is comparable to his sire, though his parents were wont to say, that this Seth had a face and a form that reminded them of one of the angels: that to be indeed an angel he wanted but those wings that winnowed fragrance through the air as they deseended on Paradise.

And thus it is that to us all gardens are beautiful, and all gardeners Adam's favourite sons. An orchard! families of fruit trees "nigh planted by a river," and that river the Clyde. Till we gazed on you we knew not how dazzling may be the

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* Blackwood's Magazine for May, 1834. Part I.

delicate spring, even more than the gorgeous autumn with all her purple and gold. No frost can wither, no blast can scatter such a power of blossoming as there brightens the day with promise that the gladdened heart may not for a moment doubt, will be fulfilled! and now we walk arm in arm with a venerable lady along a terrace hung high above a river, but between us and the brink of the precipice, a leafless lawn: not of grass, but of moss, whereon centuries seem softly embedded, and lo! we are looking to the right down, down the glen, and to the left up, up the glen; though to the left it takes a majestic bend, so that yonder castle seemingly almost in front of us, stands on one of its cliffs; now we are looking over the top of holly hedges twenty feet high, and over the stately yew-pawns and peacocks; but hark! the flesh and blood peacock shrieking from the pine! An old English garden, such as Bacon, or Evelyn, or Cowley would have loved, felicitously placed, with all its solemn calm, above the reach of the roar of a Scottish flood!

But we shall not permit the visions of gardens thus to steady themselves before our imagination; and since come they will, away must they pass like magic shadows on a sheet. There you keep gliding in hundreds along with your old English halls, or rectories, or parsonages, some alas! looking dilapidated and forlorn, but few in ruins, and thank heaven, many of you in the decay of time renewed by love, and many more still fresh and and strong, though breathing of antiquity, as when there was not one leaf of all that mass of ivy in which the highest chimneys are swathed, and buried all the gables. Oh! stay but for one moment longer thou garden of the cliffs! Gone by, with all thine imagery—half garden and half forest—reflected in thine own turn, and with thee a glimmer of green mountains and of dusky woods. Sweet visionary shadow of the poor man's cot and garden! A blessing be upon thee almost on the edge of the bleak moon! But villages, and towns, and cities travel by mistily, carrying before our ken many a green series of little rural or suburban gardens, all cultivated by owners or tenant's hands, and beneath the blossomed fruit trees, the ground variegated with many a flush of flowers. What pinks! Aye, we know them well, the beautiful garden plats on the banks and braes all round about our native town, pretty Paisley, and in among the very houses in nooks and corners, which the sunshine does not scorn to visit, and as the glamour goes by, sweet to our soul is the thought of Kilbarchan, the loveliest flower in heaven or on earth, for 'tis the prize-pink of our childhood, given us by our Father's hand, and we now see the spot where the fine grained glory grew.

We hope our stomach is not out of order, and that these fancies are not the fumes of indigestion, as Cabanis and the materialists say. No, our stomach was never out of order in its life, not even in "the Bay of Biscay O." At all events, that huge Encyclopædia of Gardening, beneath which our table groans, is no spectral illusion; and might ballast a balloon. It lies open at the one thousand three hundred and thirty-second page, and we espy much matter on the Education of Gardeners, a pleasant prolific theme. In our walks over the world, we have looked in upon hundreds of gardeners in their own houses, and have always met with a kind welcome. No other class of men are so well off for wives. How lady-like many matrons who have received us with a curtsey, a smile, and a hand, in tree-shaded dwellings not far apart from the hall or mansion house, nests in secluded spots which you may seek for, without finding among the wide sweep of the demesne, that is, its elegant cultivation still retains something of the wild character of the forest. Honest men's daughters, not degraded surely, by having been in household service which they adorned, and now visited familiarly by the young ladies, who disdained not to wear the bridal favours on the marriage day, and have sent her baby-linen duly every year. Not all such; for gardeners intermarry let us tell you, not unfrequently with maidens of the middle ranks—the daughters of statesmen (cock lairds), tradesmen well to do, and clergymen. And we could mention instances of gentle blood blushing in the faces of the children of bold sons of the spade. What matters it whom they marry, if their bosom friends be chaste, modest, and good? Many a pleasant evening have we passed in such domiciles, for we are something of a botanist, though that not much; a florist of the second rate in knowledge, and of the first in love; and though no great linguist, we have studied all the tongues of trees, and not a language spoken in the forest of which we do not know all the roots, and most of the ramifications. Soon after sunrise, whatever might be the season, we always took our departure; nor empty-handed were we allowed to go our ways, for all the gardeners who were friends of ours, enjoyed the privilege of giving presents of a dozen or two of green gages, a few pints of grozets—say the roaring lion on the fiery dragon, and if still the vernal breezes were blowing in our breast, a a flower, composed of many flowers, as we crossed the moorland wilderness, companioned us through the solitude, as if our attendant spirit were the sweet-scented spring.

But our table groans again—and fain would we relieve it from the burden; but on attempting to lift up the Encyclopædia of Gardening, we find we are not the man we once were, and our back beseeches us to remember its lumbago. A ponderous tome! But is it not now republishing in numbers? That is merciful. Now for our review.

Mr. Loudon observes that the terms knowledge and ignorance are entirely relative; that the knowledge of a chemist's porter, would have subjected him to be hanged and burned in the days of the first Popes; and that any bricklayer's labourer who reads the London newspapers, has more correct ideas on the principles of political economy, than nine-tenths of the nobility of Russia and Spain. Will he persist in saying so, with the proceedings of the Trades' Unions before his eyes? In spite of the much vaunted march of intellect during the last dozen years, and all the efforts of the Educationists to enlighten the labouring classes, they seem stone blind to the plainest and simplest truths, and hurrying headlong on the road to ruin. What does Mr. Loudon know of the Russian nobility? Among them are many men of the highest mental cultivation; and Nicholas, who may be autocrat, (how few who call him so know the meaning of the epithet!) happening to possess great talents, knows that the stability of his throne depends now on the intellect of that order. Political Economy—and good Political Economy too—Storch has a European reputation—is better studied in Russia than it is in Britain; and Mr. Loudon himself, though he may have "as correct ideas on its principles" as any bricklayer's labourer, would soon be made to sing small on the question of Free Trade in an argument with any fur-clad Russ taken at random from the nine-tenths of the nobility whom he ignorantly honours with his scorn. The Spanish are not what they once were; but the Spanish bricklayers, meaning thereby the Spanish people we are sorry to say, may be safely backed at odds against the British, in the practice of the "few plain rules" which suffice them whose lot it is to earn bread by sweat. We know the character of our countrymen, and we honour it; but they are puffed up with foul wind blown into their minds by quacks, and if it be not beaten out of them they will burst. Their knowledge of their own trades is admirable, and in strength and skill they excel all the nations: but their ignorance of the principles of Political Economy is night dark, and they go recklessly groping through the gloom, stumbling over obstructions which they can no more remove or surmount than they can change the laws of nature.

"It is impossible," quoth our sage, "to set limits to the knowledge which may be obtained by those who are destined even to the most severe and constant labour." That sounds grandly, but it is mere nonsense. Limits are set to knowledge by severe and constant labour itself; yet are they not narrow limits, and within them may be found, within the four seas, myriads of men "their country's pride." Base would it be to seek to thwart the desire for instruction; but foolish is it to direct it to unattainable objects; or encourage it to go be-

yond the sphere of those essential and vital duties of which the performance secures the corresponding rights. And no language can he conceived more foolish than this loose talk of Mr. Loudon's, to which the whole history of man in his best imaginable condition gives the lie. "If," says he, "every cook-maid, before she could obtain a first-rate situation, were required to be able to read Apicius Redivivus in the original tongue, there would be no want of learned cooks; and if no gardener could obtain a first-rate situation who had not written a Thesis in Greek, or who had not made the tour of Europe, there would be soon found abundance of gardeners so qualified." How wise and how witty!

Mr. Loudon holds, that every rational man may obtain every thing he desires, if he but desire it strongly and steadily, and carry his desire into continuous action. As he is not an irrational man, and manifestly desires to write sense, how happens it then, that he has jotted down so much portentous nonsense? "Suppose," saith he, "a man desires to be a king; that is a desire sufficiently extraordinary; but if he will first make himself acquainted with the history of all men who have raised themselves from nothing to be kings, and then consider in which part of the world he is most likely to succeed, *he may very likely obtain his object.*" Suppose Mr. Loudon himself desires to be king of Dahomey? He would find it no easy matter to kick all the native princes out of his way to the throne; and we should not fear to lay a pine-apple to a crab that, long before his ambition was gratified by finding himself sitting in state, almost naked, with a gold-rimmed cocked hat on his regal head, he would have to act, not as king's chief drummer, but as chief drum, his skin having been skilfully made into that warlike instrument, wherewith the slave of the legitimate and reigning monarch "affrighted armies." Would he, as a simpler speculation, try to be king of Brentford? That monarchy, we believe, is elective; but what a crowd of competitors! How many were the chances even against Bamfylde Moore Carew himself, who, by a rare concurrence of circumstances, was chosen by acclamation king of the beggars!

Suppose again, "that a man desires to possess great wealth,"—to be as rich as Crœsus, while he chooses to continue in that post of honour, a private station. He may attempt this, Mr. Loudon tells us, in three ways; and as he mentions but three, we may presume, that in his estimation there are but three, and that unless he follow one or other of them, a man may never rationally hope to be rich. "This he may attempt in three ways—by a saving of income and gain of time, that is by denying himself the usual gratifications of food, clothing, and rest, and laying out at compound interest what is gained by these deprivations; by gambling speculations in property; and by marriage." Thank heaven, we have no desire "to possess great wealth." We sometimes dream of gold, yea, much fine gold in mountains, Alp above Alp—a Chimborazo of bullion—gold-bars broader than the sunset clouds. Our imagination despises Mr. Canning's famous picture of a good currency—a mountain of paper irrigated by a river of gold. Wordsworth had us in his mind when he indited the pregnant line, "That poor old man is richer than he seems." But all the stories that make such a noise in the world, of our worldly wealth, are idle; for we are a mere annuitant of a few thousand pounds, and, with the exception of Buchannan Lodge, (not fifty acres, policy and all) we are "lords of our preserve, and no land beside." What then? We are not the man "to desire to possess great wealth, by denying ourselves the gratifications of food, clothing, and rest." The gratifications of food are intense, including, of course, all eatables and drinkables; and rather than forego these, might we cease to be. Yet we eat rather with a steady than a voracious appetite, and pity 'tis that we flourished not during the Grecian mythology, that Bacchus and Adriadne might have taken a lesson from us how to turn up the little finger. Neither did we ever feel any inclination to deny ourselves the gratification of clothing, except when taking the plunge or shower bath in a pool, or beneath a waterfall of the Tweed. Then the shepherdess on the hill beholds us through her hollow hand, animated image of the truth, lustrous amidst the vapours. And what would be human life without rest! O divine privilege of leisure! To us the land of Drowseyhead is the land of Faery; and as we awaken at the touch of morn's rosy fingers, what an illustration of the *otium cum dignitate*, in the person of one nevertheless well-stricken in years! We scorn the assistance of red plush breeches, worn by a celebrated philosopher to prevent him sliddering down the inclined plane of his couch,—and though we lie in finest linen, trust fearlessly to the native tenacity of our limbs and frame, and to that noble organ of adhesiveness which phrenologists have come from afar to admire. "Laying out at compound interest, what is gained by these deprivations of food, clothes, and rest!" The idea of compound interest is to us so shocking, that while our metaphysical genius would fain analyze it, our conscience instinctively recoils from the horror, and leaves the monstrous mass in all the loathsomeness of its conglomeration. Sufficient for the day is the money thereof, enough and to spare. Nor, we hope, do all poor people go unrelieved from our hotel, though now and then an idler or a drunkard may with his heel indent a curse on the gravel walk, or, in sullen spite, uproot a flower from the borders, that, like two harmless and splendid snakes, sometimes shrub-concealed, glide towards our porch. Though silly ones seem to know it not, we have all our lives been lovers of simplicity; so no wonder we delight in simple interest, and see a charm in two per cent. beyond the reaches of a miser's soul in his most avaricious dream.

And what say we to Mr. Loudon's second way of getting possession of wealth—"gambling speculations in property?" We abhor all gambling, but all speculations in property are not gambling; and hundreds and thousands of British merchants acquire "great wealth" by knowledge working, according to a rule of life drawn by honour and conscience, and rather than swerve from it, they would be poor. "The accomplished men of the accounting are they;" through them has this empire waxed great, and may the seas be for ever whitened with their sails. Too many gamblers there are in trade, and they are seeking now to strangle their native soil, but the nobler *terræ filii* will not suffer them, and Ceres smiles to see a muzzle put on the mouth of the blatant beast that has been so fiercely growling for cheap bread, reckless all the while of that industry which has already filled our market-places with cheap corn, and will keep England, "merry England" still, if the plough be not palsied, nor the natural order of civilized society inverted, and "the smiling power of cultivation," which now lies on many a once unproductive hill, withered by insane legislation for false friends or true enemies, who hypocritically bless or sincerely curse us for our power and our dominion, from lands beyond the sea, whose slavery we yet may pity, and whose liberty we do not need to envy, so long as we till the glebe that, in spite of snows and hails, shows its rich harvests to the sun, ripening in frequent glooms, and sometimes reaped by a hardy race amidst the pauses of the tempest.

But what think we of Mr. Loudon's third and last way of acquiring "great" wealth—by marriage? Why, a beautiful young woman, with a sublime fortune, is not to be sneezed at in nuptial sheets, unless it be to give the dear creature an opportunity of saying "God bless you!" An ugly old woman, on the other hand, in the stocks, is to be scunnered at, in a similar predicament, were it but to induce her to allow you a separate maintenance, and all the privileges of a bachelor. The world knows we are engaged; but were we offered our choice of two lovely beings, both beautiful,—but the one, sole child of an eminent banker,—and the other, the last of a second series of daughters *raised*, as the Americans say, not forced, from the time-honoured bed of a country gentleman impatient of widowhood, whose ancestors had killed their own mutton

from time immemorial—we should, unless her hair were very, very red indeed, take unto our bosom the dowerless damsel, were it only for the pure delight of seeing her, at our own expence, "taking off her marriage clothes," or, in other words, providing herself with a tasteful *trousseau*. In short, we would take her with rapture into our arms, though she had just a shift to her back, and but one pair of elastic garters. Like the moon without a cloud, or like the moon veiled in clouds, her beauty would thus be ours too, inasmuch, as we should be the sun that illumined the lovely orb. Think but for a moment of your bride buying, out of her own dower, you being farthingless, and receiving discount for ready money, not only the four-posted bed, but all the rest of the furniture; nay, the very house to which you bring her home, and of which, with a face of the most brazen assurance, you tell her to consider herself the mistress—she having considerately bought up the few duty, and introduced gas! Then the degradation of never being permitted, while you breathe, to put on or take off your breeches, without the consciousness that *she* paid for them (and consequently is entitled to wear them *ad libitum*), whether velvet or fustian, so inexorable is the law of the association of ideas. Far rather—so help us heaven—would we wear kilts till we dropped into the grave.

But what thinks and says Mr. London? Why, that of the three ways aforesaid, "the first is slow, but certain,—the second is dangerous,—*and the third doubtful*. From this, it is clear, that he recommends the first, and would have all prudent gardeners (for it is to them he is writing) "deny themselves the usual gratifications of food, clothing, and rest." The second—"gambling speculations in property," lie seldom in their way, and are dangerous; and the third is so doubtful, that better far a son of the spade should go sans meat, sans drink, sans clothes, sans sleep, sans every thing, than look out for a lass with a tocher. But why call the third mode doubtful? Assure yourself of the precise amount, at a fair valuation by an experienced appraiser, of the real and personal property of the favoured fair, and by marrying her instanter across the bonnet, you make yourself *ultimus et solus hæres*, to speak classically, of the great globe herself, and all that she inherits. Nothing doubtful after that, but as sure as a gun are you an opulent gardener. Your search, by the premises, was not for heart's-ease or none-so-pretty; you have got your dandelion, a flower which apprentices call by a grosser name, but what you wished for was gold; and is she not as yellow in the face, and all over, as a gowden guinea?

Again—"Suppose," quoth our beadsman, "a man wishes to become an eminent poet, he may not become an eminent poet, he may not become such a poet as Burns or Lord Byron, because the clay of which he is formed, may be originally of inferior quality to that of these men; but if his natural faculties are of the average quality, he may become a poet of respectable rank." From Mr. Loudon's cautious use of the "may," he seems merely to think that the probabilities are against the generality of gardeners becoming absolute Burnses or Byrons; the thing is not impossible, for though their "clay" may be of inferior quality, so may it be of equal, or haply, of superior; and from soils of average quality, pretty heavy crops of poetry, which may be sold per sample, may be depended on with ordinary management. And how is the man, gardener or not, "wishing to become an eminent poet," to proceed? "First, let him read all the poetry that has been written in such languages as he understands; next, let him, by the aid of books on rhetoric, and on the art of poetry and criticism, analyze all the best poems, and treasure up in his mind all the figures, metaphors, &c., that are made use of in them. Then let him, according to the line of poetry which he chooses to pursue, place himself in circumstances favorable to its study, and persevere till he produces at least a new combination of former figures, joined, if possible, with some which, as Addison has expressed it, are both 'strange and new.'" And thus may he become an eminent poet of respectable rank.

After these remarks on extravagant desires, that is to say, on desires derided as extravagant by thoughtless people, and on what Mr. Loudon chooses to call the possibility "of attaining ends generally considered as depending on fate, original genius, or predestination, it will not be necessary," he says, "to hint at the practicability of any man's attaining eminence as an artist of any description, as a literary character, natural or experimental philosopher, mathematician, divine, lawyer, or physician:" If all this be true and we should be sad and sorry to deny it, we cannot help wondering at there being so many professional gardeners, so few kings, and fewer poets. But our enthusiastic friend drives his doctrine on desire still farther home, assuring us, "that no self-convicted sinner ever failed of being converted, nor any persevering lover of getting possession of his mistress." How does he account for remorse committing suicide? And if a dozen persevering lovers are "a' wooin', puin' at her," will they all get possession of the same mistress?

Other faculties, however, are necessary to ensure success in horticulture, besides desire, and of these the chief are attention and memory. "Unless," says he, "we pay attention to what is addressed to us, whether by the ear or eye, it is impossible we can remember, because the sight or sound has made no impression on the memory, and without memory there can be no knowledge." Of the truth of this original observation, he gives a very striking illustration. "It is a common thing for a person to walk out and return without being able to describe, or even mention, any one thing he has seen; or to read a newspaper without being able to tell what he has read, further than to give some vague idea of the subject." But attention alone will not do; and he instructs the young gardener how to cultivate memory on philosophical principles, after a fashion that makes small-beer of Feinagle. The generic names of plants and animals are, he tells us, of three kinds (just as there was three ways of getting rich); "those composed of words indicating something of the nature or appearance, or uses of the plants,—those composed of the name of some eminent individual,—and those composed of native or local names. Do you wish to remember the name of some plant of the second or third class? Then,

"Thus, Gordon was a nurseryman at Mile End, a short, lame, sailor-looking man, who dressed in blue trousers, chewed tobacco, and was without offspring; it is easy to imagine his wife reproaching him with the last circumstance, while he holds out to her a plant of Gordonia, as a substitute for a son and heir. Elettari being extensively cultivated as a spice by the natives of Coromandel, we may imagine a group of these Indians arriving after death at the gates of Paradise, each with a bundle of the plant. The porter may be supposed, on first opening the gate, to be about to shut it in the faces of these poor black fellows, till they shout out, "Elettari." "What then," says the porter, "you are elect-are-ye?" and lets them in. Elettari is the only native generic name in Monandria Monogynia; the native specific names in the same class and order are Allughas, Zerumbet, Cusumunar, and Mioga, which may be easily likened in sound to Hallilujah, strumpet, cheesemonger, and Maijocchi?"

All other names, whether of science, or those which occur in the common intercourse of life, as of persons and places, are to be recollected "on the same principle," "and the more ludicrous the association, the better will it be recollected." All this may be extremely witty; but then, Mr. Loudon should recollect that a sense of the ludicrous is not equally given to gardeners; that in some it is fine, in others coarse; in some quick, in others slow; that in many it seems almost dead or dormant, and in most suppressed during the duties of daily life, by other senses of a higher kind. Be that as it may, it is insulting and injurious to vegetables to recollect their names by ludicrous associations alone,—and if such of the Monandria Monogynia as rejoice in their native specific names, could be informed of Mr. London's new nomenclature, they would rise up to a plant, and push him from his stool in his pride of place

The coarse, vulgar wit of animal matter we can well believe very offensive to a sensitive vegetable; and coarse vulgar wit as Mr. Loudon's here as ever set the smiddy in a roar. What decent gardener would call anything with buds or leaves—strumpet? What gardener who had read his Bible, as a touch of the ludicrous, would change allughas into Hallelujah? What a capon, who should chuckle to call, cusnmunar, cheesemonger? And as for remembering for ever Mioga, by pronouncing it Maijocchi, does Mr. Loudon imagine that the name of that ungrateful reprobate is familiar as a household word in English gardens? He makes such free use of the scissors, that we do not always know when he is original and when he is indebted to wits no way inferior to himself in power of illustration. Is the following his own, or Feinagle's, or some other fools? In spite of inverted commas, it must be a lump of London.

"If I am told that the Dutch merchant, Schimmelphenninck, was a very wealthy or religious man, that will not assist me in recollecting his long name; but if I say to myself there is some resemblance between Schimmelphenninck and *skim-milk-pen and ink*, the resemblance may enable me to do so; or if I have recourse to a Dutch dictionary, and discover that, *schimmel*, is grey, *phennick*, a penny, I have grey penny, as a synonyme, which, with the operations the mind has undergone, is getting at it, will most probably impress the original name on the memory. If a highlander tells us his name is Macpherson, I immediately interpret it *Mac-parson*,—son of a parson—son of a Catholic priest and a Highland maid; and I figure to myself his first parents of a former age, a Franciscan friar, 'an oily man of God,' and a bare-legged brawny wench. I see the monk receive her into his cell, take her confession, lead her from the confessional to his couch, there to kneel and join with him in prayer: the straying hands of the holy father surprise the penitent, but he consoles her: "let us forget ourselves, daughter, all flesh is grass," but God is every thing, and every thing is permitted to his servant St. Francis,—let our bodies take their course!' Nine moons hence, and the sun rises on the plantlet of the tree ofMacpherson."

Having thus strengthened his memory by the same means by which he has refined his taste, the gardener cannot fail in giving himself "an intellectual education, independently of acquiring his profession." Eight hours per day, we are told, is about the average of his labour throughout the year. It is not often severe; so he has eight hours for "rest, dressing and undressing; eight for labour, and acquiring the practice of gardening, and eight hours for refreshment and study. On comparing this time for study with that which is usually devoted to it by young men at college, not the generality of young men, but those even who attain to eminence, we will find the difference very inconsiderable." The young man at college, Mr. Loudon reminds us, require the same time for rest as the gardener, and at least two hours more for dressing and undressing; for breakfast he requires an hour, and for dinner and tea three hours. It is so long since we were a young man at college, that we cannot speak confidently as to all the items in Mr. Loudon's account. But never shall we believe that we required at least two hours for dressing and undressing—washing and shaving of course included in the bill of the day. For undressing we could not have required above a minute in the twenty-four hours *then*—on the supposition, a liberal one, of our having undressed twice—for we do not require for the same purpose, and on the same supposition, more than two minutes *now*. Five seconds for neckcloth, five for coat and waistcoat, cossacks five, drawers five (for if you hurry you tear), and stockings five each—on an average of a year—for occasionally we keep dancing about on one leg, with the silk flipped over the instep of the other foot, and clinging to it with an obstinacy that would have decomposed the man of Uz, though not us—and that makes one minute. No allowance is here made for shirt or flannel waistcoat—but these no true Scotchman changes above once a week; that is a work for sabbath hours, and we have known it take double the time of all our other dis-apparelling. No young man at college will ever be in the first class, or senior wrangler, who cannot undress within the minute, and dress within the quarter of an hour—so, from Mr. Loudon's most extravagant and outrageous allowance of two hours, subtract one hour and twenty-eight minutes, which add either to sleep or study, or in equal proportions to both, for surely you would not add them to eating, which, according to Mr. Loudon, already engrosses four hours, without including its consequences, which, however, perhaps fall under the head of relaxation. Who ever took an hour for breakfast? Why we could make three breakfasts—and material breakfasts, too—in that long space of time, were it not for fear of a surfeit. Three hours, "at least," for dinner and tea, is likewise enormous; and a poor creature indeed must he be, who takes tea at all when reading for honours. He makes his debut in the world in the shape of a wooden spoon.

It finally appears, that your gardener, who works on a yearly average but eight hours per day, has more time for study than your Oxonian or Cantab. It is true, allows Mr. Loudon, that he is "subject to the time employed in eating, but that may well be considered as compensated by the knowledge of botany he acquires in the garden during his hours of labour." The great advantage, however, which your gardener possesses over your Oxonian and Cantab is, "that, unless his religion forbid, he may study at least twelve hours every Sunday." Mr. Loudon is the most liberal man in his religious opinions we ever heard of, as you will see by and by; meanwhile, do you not admire the coolness with which he lets drop, "unless his religion forbid," into the above passage? He recommends that the Sunday shall be employed thus:—Morning commenced as usual with a language; "the remaining part of the day we would dispose of in portions of one, two, or three hours, in bringing forward those evening studies which we had been least successful in during the week, or found ourselves most in want of for actual use. This day is also particularly adapted for drawing, which, though it ought not to be neglected with artificial light, yet goes on best with that of the sun." Arithmetic, mensuration, and land-surveying, mechanics and experimental philosophy, essay and letter writing, "both with a view to improvement in the style and penmanship," and, if possible, miscellaneous reading from an Encyclopædia—these are the studies on which the gardener, according to Mr. Loudon's scheme of education, is to be employed twelve hours every Sabbath or Lord's day.

These are some "of the branches which best deserve his attention." But this gardener's friend holds that "one branch of knowledge is as much as any person ever does or can excel in." A gardener, therefore, should not he thinks, "attempt to excel in any one branch of knowledge besides that of gardening." Even in botany he cannot arive at great perfection, from not having an opportunity of consulting the herbariums and books, which are only to be found in the metropolis. Instead therefore, of vainly attempting "to excel in any one branch except gardening," he ought to follow another plan entirely, and a most plausible one it seems in Mr. Loudon's simple words. "He ought rather to make himself acquainted to the degree that circumstances may permit, with the whole cycle of human knowledge." But, even when he has done so, he must not think of ever being able to become "expert at chemical analysis, dissection of animals, solving problems in any of the higher branches of mathematics, or to excel in painting, music, or poetry."

Discouraging doctrine, and we hope, unsound: but how is the gardener to find means of making himself acquainted with the whole cycle of human knowledge? "To the degree that circumstances may permit," is a most indefinite degree; and should it so happen that the gardener has found a place "among the farthest Hebrides," the degree to which he may have made himself acquainted with the whole cycle of human knowledge would be hardly, we should think, worth taking, except for the honour of the thing, and to be worn as a titular ornament. In

happier circumstances, the source from which he is to derive his general knowledge, "it may be easily conceived is chiefly from books." He is to derive aid from professional men, men of talents, and learning, wherever he has an opportunity of conversing with them, public lectures, artists, artisans, manufacturers of every description, manufactories, engines, mines, dockyards, and all other works displaying human skill. But the grand source is books, and the question is, says Mr. Loudon, how a journeyman gardener, whose wages are often less than those of a common labourer is to procure them?

Now it is well known to all persons conversant with such matters, that there are, over and above the more rare and uncommon one of purchase, three ways of procuring books, begging, borrowing, and stealing, though by means of a fine but not difficult analysis, all the three nay all the four, may be reduced to one—to wit, stealing, as a few words will shew. You pretend to purchase books, but you never pretend to pay for them; and thus, "to the degree that circumstances may permit, you become acquainted with the whole cycle of human knowledge." The distinction between begging and borrowing, is so slight, as to be at times almost imperceptible; but begging is more nearly akin to purchase without payment; for in both cases alike you make the book your own, with consent of the precious owner, and write your name on it, not only without compunction, but with a rejoicing conscience. Borrowing, you perceive at once, is stealing, with a gentler name, aggravated by audacity, for you do not for a long course of years deny the fact; but on the contrary, apologize every time you meet the previous owner, which however, you take care shall be as seldom as possible, nay, promise to return it on Monday. Your friend cuts you, or goes abroad, or marries, and forgets his books in his children, or, best of all dies, and the book or books are yours for life. Mere simple stealing, that is shop-lifting—though common, is not correct; but being committed probably on a sudden impulse, on the sly, and with shame, it is a venial offence in comparison with horrowing: though we believe that he who steals many books, one after the other, never gives over doing so, even after frequent detection and exposure, will be almost sure to take to borrowing at last.

With such sentiments on stealing, we were startled by Mr. Loudon's answers to his own question, "How is a journeyman gardener, whose wages are less often than a common labourer to procure books?" Our answer is borrow them, and make it a fixed rule to purchase no books excepting grammars, dictionaries, and other elementary works, and of these, used and and cheap copies." And from whom is he to borrow? Why from the head gardener to be sure. And how does *he* procure them? Why, he borrows them of course, from "the patron under whom he serves." And how came they into *his* possession? Probably by purchase, without payment; and thus do the journeymen gardeners over all Britain "become acquainted as far as circumstances may permit, with the whole cycle of human knowledge," at the expense of John Murray, Longman, and Co., and William Blackwood! We pity the poor booksellers.

The sort of books, says Mr. Loudon, "desirable to borrow," independently of those connected with professional acquirements, are treatises on chemistry, zoology, mineralogy, and above all, a good Encyclopedia—one systematically, instead of alphabetically arranged would be the best; but as most existing libraries, he says are now stocked with the Encyclopedia Brittannica, or Rees' Cyclopedia, "these must be taken, till a well executed one, on the plan of the Encyclopedia Metropolitan, now publishing (but badly executed,) finds its way into general use." The Encyclopedia Metropolitana is not badly executed, as this conceited gentleman impertinently says in a parenthesis, any one number of it being worth all he has compiled since he became a clipper. Then there is the Edinburgh Encyclopedia, edited by Sir David Brewster, now complete, and the property of that enterprising bookseller, Mr. Tegg, full of the most useful information of all kinds, as Mr. Loudon well knows, though he has kept his left hand thumb upon it, all the while brandishing in his right hand a formidable pair of shears, that might trim a privet hedge, or the mane of a bonassus.

[So much for the First Fitte.]

STRUCTURE OF THE RADISH ROOT.

It is well known to most observers, that at the summit of the root of the common radish, at the very base of the stem, or that place which the French call the *collet*—the English the *neck*, is an appendage, at first resembling a membranous sheath, enwrapping the young root, and subsequently as the root distends, becoming two loose straps hanging down on each side of the root. The nature of this appendage was unknown until the late ingenious L. C. Richard discovered the existence of two modes of germination, called the *exhorhizal* and *endorhizal*, and suggested that the radish was an example of the latter mode, a notion which has been generally admitted by recent writers, notwithstanding the circumstance, that, if endorhizal, the radish would offer an exception to a very general law that endordizal germination goes along with endogenous growth. M. Turpin has lately demonstrated that the fleshy supposed root of the radish belongs to the ascending axis, not to the descending one, and that, consequently, it belongs to the system of the stem, and not to that of the root. In the next place, he asserts, that the tumour, which ultimately becomes the raddish, is in the beginning cylindrical, and that its cuticle loses at a very early period the power of distension; in short, that it dies, and separates from the subjacent living matter, just as dead bark separates from liber and young wood in old stems. Now this premature death of the cuticle is connected with the rapid lateral distension of the tumour, the cause of the existence of the two appendages in question, which are nothing more than two straps of dead cuticle, rent asunder by the gradual but rapid distension of the part that they originally ensheathed.

EXPERIMENTS ON THE CULTIVATION OF TURNIPS.

BY MR. HUGH MUNRO, ASSYNT BY EVANTON, ROSSHIRE.*

I HAD a field of nine acres which I wished returned into grass, and, from the little experience I have as a farmer of four years standing, I considered that grass after turnip eaten off by the sheep, would be better than after any other course. I at one time thought I should be obliged to purchase bone manure for this field, not having any fold manure; but the expense of bones for nine acres, at twentyfive bushels per acre, at 2*s*. 10*d*. (the price last season), would amount to 3*l*. 10*s*. 10*d*. or 31*l*. 17*s*. 6*d*. I have, however, heard that fourteen bushels of bones per acre have been applied to raise turnip with success, which makes 1*l*. 19*s*. 8*d*. per acre, or 17*l*. 17*s*. for nine acres. So I determined to try and find a substitute that would be cheaper and equally effective, in which, I am happy to say, I have succeeded beyond my most sanguine expectations. I got some of the small tenantry to bring me a quantity of peat-moss, for which I paid 2*l*. 10*s*. I then mixed all the chaff from the mill, the fire ashes from my own house, together with the sweepings and fire ashes, &c. &c. of my servants' houses, (for which I gave straw to bed their pigs,) the scrapings of roads and ditches, and then wetted the whole with the superfluous urine from the fold, having added a little lime and house dung, and turned it frequently till it was well pulverised; and in this way I prepared forty-five single cart-loads. During the winter, I drilled from the stubble the field intended for turnip, and let it be exposed to the weather in that state until the end of May, when I harrowed it smooth, and then drilled it again by splitting the former drills. I then put a light roller over the drills to make them smooth, and commenced laying down the turnip in the following manner. I had five men with large dibbles made of hard wood, with which they made holes eight inches apart on the top of the drills, pressing down the dibble with the foot, each man having a single drill, followed by a woman with a basketful of prepared manure. and into each hole made by the dibble she placed a handful of manure. The manure is taken to the field in carts from where it is made, and the driver fills each woman's basket as they may require it. After her, followed a girl with a little bag of turnip seed, putting from three to six or more grains on the top of the manure, with her fore finger and thumb, drawing a little earth over it, and in this manner I carried on five drills at a time with fifteen people ; viz. a man and two women to each drill. I only expended two pounds of turnip seed for each acre. The whole went on like clock-work, and I finished the nine acres in four days, at an expense of about 5*l*. including purchase of peat-moss. The turnips grew rapidly, and I had them cleaned in the usual manner, sometimes leaving two plants in one hole, which I found to answer well, especially when the plants happened to be a little distant from each other, say about two inches. I have thus raised an excellent crop of large turnips, by applying *only* five single cart-loads per acre of this prepared manure, and the expense of the whole dees not exceed 5*l*.; indeed, they are so good, that I am now stripping one half previous to putting on the sheep. Every one who has seen the turnip has been surprised, and several in my neighbourhood intend adopting the same plan next year. I shall now attempt to make some observations on this plan, which I have adopted, and which I believe to have originated with myself; at all events, I never heard or read of such a plan before; and you will readily agree that the experiment was tried on an extensive scale. I will now observe that

1st. Where the land is foul with weeds, the usual mode of cleaning should be adopted, and then drilling the land once.

2nd. That the manure to be prepared, should be made as strong as possible, by the superfluous urine of the court-yard in winter; and that the scrapings of roads and ditches, with rubbish of old houses, &c. would be preferable to peat-moss. A boll of lime should also be mixed with every ten cart-loads, and, when well attended to, less than five cart-loads per acre will be found sufficient.

3rd, I observe that, although the season may be dry, and the sides of the hole liable to fall in, yet, by making the women with the manure follow the dibble quickly, this inconvenience) and I may say it is the only one) will be obviated in a great measure; and, where this was done, I found no difference in the crop of turnips.

4th. This plan can be followed in all kinds of weather, and *better while raining*, which is not the case in the usual method.

5th. Where five or more grains of the seed come up together, (forced on by the strength of the manure, over which the seed is immediately placed,) they will force themselves through, even should the soil be barkened by rain, wind, and sunshine. And,

6th. Should dry weather be the character of the season while sowing the turnips, they will show a healthy braird, the manure, which is their food, being close at hand, and they not being obliged to push their delicate roots through a quantity of earth in search of nourishment, as in the method now in use.

I have now given a statement of my plan of cultivating turnips, with the observations I made, as far as I have been able; and I am certain, that whoever tries the above plan, will not be inclined again to purchase the bone manure, at its present price.

* From Trans. Highland Society.

EXPERIMENTS ON THE GENERATION OF PLANTS, PARTICULARLY PUMPKINS, HEMP, AND LYCHNIS DIOICA.

BY CH. GIROU DE BUZAREINGUES, CORRESPONDENT OF THE ROYAL ACADEMY OF SCIENCES.

In 1832, I sowed in my garden three varieties of the pumpkin, the Barbarine, the Pastisson, and the Giraumon.

I cannot conceive that any foreign pollen could be conveyed by the wind or by insects, as there were not for three leagues round, any pumpkins similar to my own, nor probably other pumpkins of any sort.

About the 27th of July, I took care to destroy all the male flowers before they were blown, as all the female flowers which had blown before this were abortive. The fruit became yellow, when about the size of a cherry. The number of abortive plants were fifteen barbarines, and two pastissons.

After the 27th July, I began a series of different experiments, either by means of artificial fecundation and without mixture, by hybridation, or by the destruction of the males : I in the end, left my plants to themselves.

I proceeded with the artificial fecundation, without mixture and hybridation.

1. In the humid way, by separating the stamens in the calyx, and by diluting afterwards the paste with a considerable quantity of water to render it liquid, and touching the pistils with this liquor by the aid of a camel hair pencil, or by turning in the bell-shaped corolla of the female flower.

2. By insertion, placing one or more male flowers, deprived of the corolla, into the female flower, and enveloping them as it were in a purse, by the aid of a ligature around the side of its border. This expedient appeared proper, to disperse from the pistil all foreign influence which might have deranged my experiments.

3. By simple insertion, that is to say, by placing many male flowers in a female flower without a ligature. In order that I may be certain of the hybridation, I take the precaution the day before to destroy, previous to their expansion, the male flowers of the variety which I purpose to cross on the morrow. If however, after this precaution, it sometimes happens, before the rising of the sun, and the awaking of the bees, male flowers have expanded, I destroy them instantly, and leave them to subsist without artificial fecundations, the females which were their neighbours, in order to prove if there was sufficient nearness to the male, under circumstances little favourable to the dispersion of the pollen, to the females that were fecundated, and, to render useless my trials of hybridation.

If it happened that the female flowers, of the variety which I wished to cross, were near expanding, I took advantage of the others blossoming, and even sometimes by an incision into the corolla, prevented the procedure of hybridation.

I tried also the artificial fecundation with males gathered the day before and withered.

Although there had been dry weather for three months, my experiments were attended with success, owing to the care I was at in watering the pumpkins abundantly every evening.

In fine, to avoid confusion, I marked all the female flowers, the object of one experiment, with long rods of wood, numbered and carefully registered,

I would however have been liable to mistakes, if I had not first destroyed the abortive fruit, as soon as the abortion had taken place, taking up the correspondent rods, and carefully registering this with the designation of the proper number.

Here, I may recapitulate the results of these experiments.

In fourteen trials of artificial fecundation, without mixture by the humid way, one only was successful.

Upon four female flowers, which had each a male flower of their own proper variety, three produced fruit, only one was abortive, and this abortion was owing a little to a blossom on the stem, which in the lower part nourished also a pumpkin well developed.

Upon five female flowers which had each many males of their own proper variety, not one was barren, and the pericarps were filled with seeds provided with kernels.

Upon fifty-three female flowers of the barbarine which had each received a male pastisson flower, twenty three were abortive, among which, two had received two males gathered the day before.

Among these which prospered, many of them had not blown when all the males of their variety were destroyed.

In three female flowers of the pastisson, which had each received a male barbarine flower, one only proved abortive.

Upon nine female flowers of the barbarine, which had each a male of the Giraumon, three only were quite abortive ; one only was filled with seeds, and this one by exception had been fecundated by the males of its own variety, and it was demonstrated to me that it was so in effect. As to the other five :

One, was of the diameter of two inches six lines, of a size above the medium of my barbarines, produced nothing but one seed provided with a kernel, and in the other four seeds, one of which was of more than ordinary bulk, and three very small, the whole were destitute of kernels, and presented only the episperm.

A second, of the diameter of twenty-two lines produced many seeds, one of which only was provided with a kernel.

A third, of the diameter of twenty-two lines, produced only two grains destitute of kernel.

A fourth of the diameter of eighteen lines, produced nothing but two very small seeds destitute of kernel.

The fifth, of the diameter of sixteen lines, produced many seeds, of which one only was provided with a kernel.

According to the small number and condition of their seeds, these five barbarines presented a striking contrast with all the others, in which were found a great number of seeds, sometimes more than a hundred, of which the greater part were provided with kernels.

Of two female pastissons, each of which had received a male giraumon, neither prospered.

One female giraumon, which had received a male pastisson, proved abortive.

Upon seventeen female flowers expanded in the morning, when the precaution had not been taken to destroy the males, and leave them without artificial fecundation, after the destruction of the expanded male flowers, seven produced fruit.

Upon thirty-one females expanded in the morning, after having taken the precaution the day before to destroy the males which could be discovered, and to suppress in the morning, previous to the rising of the sun and setting out of the bees, all those which having escaped the first investigation, and were expanded thirty were abortive.

Upon sixty-two female plants which had flourished after the conclusion of these experiments, twenty-five proved abortive.

The pastissons produced by these experiments, have been wholly without a crown; yet I have taken seed from them in subjects richly provided with it; they have been on the other hand, a little crumpled or warty: they had also the flat or discoid form, and the yellow colour of the variety from which they came.

The first change of form induced me to suppose, that the seed which I sowed had suffered hybridation by the assistance of the wind or insects. The possibility of hybridation had been many times proclaimed as deduced from various experiments; it has been proved to me by the evolution of fruits coming from flowers in which I have tried it, and by the sterility of those placed in the same circumstances, but by design deprived of the male flower. But I was permitted to observe a new proof, and I did not neglect it.

I sowed in 1833, the seed arising from my mixtures of the preceding year.

Mark the result of this second part of the experiment.

The seed furnished by the barbarines united with the pastissons, produced fruits which were, some the form and colour of the pastissons, others the colour of the pastissons with a spherical form.

From the seed furnished by the pastissons united with the barbarines, were produced fruits which had completely the form and colour of the pastissons; others which had the globular form of the barbarines, and the colour of the pastissons; others in fine, which had the lengthened form of the cucumbers, and the colour of the pastissons.

The seed produced from doubtful hybridation of a barbarine with a male giraumon, produced me fruits which changed these doubts into certainties; for they were absolutely the form, the bulk, and colour of the barbarines.

The grains, in small number, furnished by the barbarines allied with the giraumons, have produced nothing, although cultivated with care.

Observations on the Results of these Experiments.

The females which flourished in the period when I had destroyed with care all the males, before their expansion, were all abortive. There is at the same time, first, an exception of one in twenty-nine of those which I wished to fecundate by the humid way; second, an exception of one in thirty-one of those which I had left to grow without artificial fecundation, in the period when I attempted the day before, previous to their expansion, to destroy the males of the variety which I proposed to cross two days afterwards; third, of those which I wished to fecundate with the pollen of the flowers gathered the day before.

Hybridation with the giraumons, was only partially successful.

The varieties then, of pumpkins employed in my experiments, cannot reproduce without the concurrence of the male.

This result is in perfect harmony with that which was obtained by M. Desfontaines in 1831.

Among the other results of my experiments I will remark the following:

1. The defeat of fecundations by the humid way. This fact is in accordance with a general observation that rain falling at blossoming time, occasions the falling off or abortion of the fruits. Humidity co-operates in two ways to produce this last phenomena, as an obstacle to the opening of the cells of the anthers, and by the activity which it gives to the vegetation of the stem, which is hurtful to that of the fruit.

2. Fecundation cannot be certain, except a male flower be expanded for some time near to a female flower also when this expansion only takes place before the rising of the sun and the awakening of the bees: it is necessary that there be a cause to set at liberty the pollen, and another which may transport it to the female flower.

3. Fecundation is uncertain when the male flower is already becoming faded.

4. The produce of fecundation is in proportion to the abundance of the pollen.

5. The existence of a small number of sterile seeds are sufficient for the development of the pericarp.

6. The possibility of hybridation is incontestible; but it is more or less difficult according to the distance or difference among the varieties which we wish to mingle.

7. Among plants as among animals, the influence of the male upon the forms and the colour of the produce, may be such as to render imperceptible that of the female.

8. By hybridation, we can obtain anomalous forms, which may neither resemble, not even in a medium degree those of the father or mother.

Though the presence of the male may be as necessary in androgynous or monoicous plants, as in hermaphrodite plants, to the fecundation of the female, we ought not to conclude that it is the same in dioicous plants. In these, the male is latent, and in the female plant it manifests itself at the same time, sometimes by its organs.

To deprive this female of all communication with males of its own species, it is not necessary to rob it of the unseizable masculine power which is in it: and although we may be ignorant by what means such a power can be supplied, it does not follow that there cannot be such a power.

When an organ exists, the capacity which is represented, is contained in it: to suppress this is to destroy it. But because there is not an organ in a plant, or in an animal, by which it may concentrate itself, or by which a faculty is unveiled that accords with all other organized bodies, or is capable of becoming so, we would not infer so much, if we were not authorized by constant observation to draw this conclusion of the total absence of this faculty. Where are the male organs of the polypus, of the female aphis, or of the *Daphnia pulex*, and the like?

Where is the organ of vision in the medusa, or that of hearing in insects?*

I will not insist more upon these ideas which I have already presented and developed in my book on Generation; I pass to the following facts.

I repeated my experiments upon the hemp plant and upon the *Lychnis dioica*, with so much care as to authorise me to affirm that these plants reproduce themselves without the aid of the male organs.

In 1832 and 1833, I attentively examined the flowers of hemp which I had planted out for my experiment, after having destroyed all the males before blossoming time, in order that there might be no rudiments of the stamens in the envelope of the pistil. The observation was extended to seventy-six plants; my eyes were assisted with a good magnifying glass, but nothing could be discovered. I do not deny so far, that the stamens or rudiments of the stamens may light upon the females of the hemp. I have found it so myself in other circumstances: but this was not the case in my seventy-six subjects. How do you know? tell me; have you verified it in all the flowers? No: but observation has taught me that it is in general sufficient to understand the sexual organization of one flower, to comprehend a little of that of all the flowers on the same plant; and I have only occasion to study one flower on each plant: I verified also the more early. Again, can we reasonably suppose that the rudiments of the stamen, inclosed in the envelope of the seed organ, can be able to fecundate all the females of a neighbouring plant? My observations upon the pumpkins is, that fecundation by the pollen, does not make sport of all these obstacles, and that it is more to hinder than to further it.

My seventy-six plants of hemp were all blown, and abundantly; the seed was well developed; it was completely isolated; there was no hemp field nearer than the distance of half a league, in a country interrupted by hills and valleys, the vegetation was early, and a high wall acted as a safe shelter from the west wind, which can carry pollen a long distance, if any exists, I will add that the flowering and fructification of my hemp have been general and of short duration.

Upon *Lychnis dioica*, I commenced wholly (after a complete destruction of the males before blossoming time,) upon the female subjects, where were found the rudiments of stamens; but as it is necessary to understand, with respect to this, the state of one flower to judge of all those of the same plant, it has been easy to suppress, before blooming, all those plants where were found the rudiments of stamens; the others having produced seed in great abundance.

I wished to be assured, among these, in the course of the blossoming, if the pistil had not received pollen which could be carried to it by the wind or by insects, also what was the indisputable cause of the precocity of my *Lychnis*; and for this purpose, I examined many of their pistils with a microscope, but could not discover any globule of the pollen.

I continued, upon the *Lychnis dioica*, my observations upon the aptitude of the seed to produce one sex rather than the other, following its situation upon the stem or upon the verge, (*trophosperme*).

This plant is dichotomous by the abortion of the median stem, but this abortion is not constant, especially among the females, and in this case, the median stem is slender, and terminated by a flower.

After the observations which I have already made and communicated to the academy, from which it results, that the aptitude of the seed to produce

* See Alphabet of Insects, Second Edition, for different opinions on the Hearing of Insects.

females is much greater at the top than at the base of the stem, or of the spike, or of the verge, and also upon strong and more vigorous stems, than upon slender stems, I ought to infer that it will go on increasing from the lower to the higher bifurcations, and that it will be less upon the direct continuation of the stem than upon its branches. These results have not disappointed my attention.

I divided my seed of the *Lychnis* into four parts: the first produced from the lower branches; the second from the direct continuation of the stem; the third from the second pair of branches in going from below to above; and the fourth from the third pair.

I divided the second part into two sections, of which one was taken from the base or lower half, the other from the summit or upper half of the verge.

Here are the results:

The first part gave me 268 males, 247 females: in the proportion of 1085 to 1000.

The second part, first section, 186 males, 160 females: in the proportion of 1162 to 1000.

The same part of the second section, 200 males, 182 females: in the proportion of 1099 to 1000.

Total of the second part, 386 males, 342 females: in the proportion of 1129 to 1000.

The third part, 217 males, 244 females: in the proportion of 889 to 1000.

The fourth part, 201 males, 255 females: in the proportion of 788 to 1000.

This experiment appears curious by the regularity of its results.

New experiment on the Hemp.

I supposed that seed of a high colour ought to be more especially formed under masculine influence than seed of a pale or ashy colour. I in consequence sowed separately, in 1832, from seed of a deep green and streaked with brown, and from seed whitish or greyish white.

The first gave me 137 males, and 108 females: in the proportion of 1268 to 1000; and the second, 59 males, and 68 females: in the proportion of 868 to 1000.

The experiment was repeated in 1833.

The brown and streaked seed gave me 265 males, 258 females: in the proportion of 1007 to 1000.

The pale seed produced 153 males and 175 female: in the proportion of 874 to 1000.

If it was more marked the first year than the second, it is a little owing, either to the differences of the colour, or still more to the form, the brown seed being more flattened than the pale seed, which was more globular.

I may remark that in 1832, brown seed had been sown in two different parts of my garden, and that in both places it produced a proportionally greater number of males, than the pale seed.

As these results appear to me rational, I have no doubt they will be obtained by all those who wish to try the experiment.

The advantage of this discovery may be to furnish cultivators with the means of knowing before-hand if the seed which they intend to sow ought to produce a greater relative number, whether of males or females, a circumstance which is not altogether indifferent to them.

ON DIASTASE* AND ITS IMPORTANCE IN VEGETABLE PHYSIOLOGY.

BY M. DUTROCHET, MEMBER OF THE INSTITUTE.

The tegumentary envelope of the grains of fecula is burst, and the substance which contains these grains is set at liberty by the action of many agents. The most generally employed of these agents is water heated to a boiling temperature. When the quantity of this liquid is considerably increased by the substance which it dissolves, it cannot form a liquid paste, we see that when it is left to cool, it precipitates, not only the insoluble teguments of the fecula, but also a great quantity of the substance which has been dissolved by the heat. The quantity of this substance which rests dissolved in the cooled liquid, is so trifling that it can scarcely be perceived to augment by its presence the density of the water.

I have proved that this density of the cooled water, loaded with as much of the soluble substance of the fecula as it can contain, is only 1.002, the density of water being 1. When the quantity of this substance dissolved in hot water is very considerable, it coagulates by cold. This coagulation is the result of a virtual precipitation of the soluble substance of the fecula, the substance which rests suspended in the liquid, ceasing to deserve that name; and is that which is called the paste (*colle*). The interior substance of the fecula also, indefinitely soluble in boiling water, is very little in cold water.

We can reasonably conceive that the boiling water determines the bursting of the teguments of the grains of the fecula by softening them, and dilating by heat the substance which they contain. We ought to add to these causes of bursting, the endosmose which cannot fail to be very energetic on account of the great density of the liquified substance that encloses the grains of the fecula, bathed exte-

* As chemists are not yet agreed upon the composition of fecula, and in consequence the number or names of substances in which it is contained, I abstain from adopting here any of these names.—AUTHOR.

riorly by the hot water. The endosmose introduces water into these small vesicles, which become also extremely turgid and which finish by bursting.

The diastase, without being at all considered as a chemical menstruum, produces, notwithstanding, the dissolution of the fecula with great rapidity. The manner in which the diastase acts in performing this phenomenon, appears to me easy to be determined. The diastase cannot dissolve the teguments of the fecula. This fact is proved by experience; for the prolonged action of the diastase upon the teguments of the fecula previously separated, do not cause them to lose any of their weight. It is not consequently, by attacking these teguments that it occasions their bursting. It appears then necessary to have recourse exclusively, to the action of the diastase upon the interior substance of the fecula. We have said above that this last is very little soluble in cold water. But, the accession of an excessive small quantity of diastase, 0.0005 for example, gives rapidly to this substance an extreme solubility in water. The mode of this chemical action is unknown; but the fact that is thus unveiled to us, is one of great importance, not only in chemistry, but also in physiology. It is evident that it is to this augmentation of the solubility of the interior substance of the fecula, we must refer the bursting of the teguments which enclose it. By reason of its acquired solubility, this substance forms with the water a liquid very thick; it exercises in consequence an endosmose very energetic, and for this reason it makes the delicate teguments of the grains of the fecula swell rapidly. To verify this theory, I experimented comparatively upon the force of the endosmose of cold water, saturated as far as possible with the soluble substance of the fecula, by the previous action of boiling water, and upon the force of the endosmose of cold water, loaded with a quantity of this same substance, modified and rendered soluble by diastase. The first of these liquids, the density of which was 1.002 did not produce the slightest endosmose; the second, in which the water was loaded with the interior substance of the fecula modified by diastase in the proportion of one-forty-eighth of its own weight, and in which the density was 1.006, produced an endosmose, which, compared with that of sugared water, (*eau sucrée*) of the same density, it was found to bear to it the proportion of 7 to 9. In employing a solution of this same substance of which the density was 1.013, I obtained an endosmose which compared with that of the sugared water of the same density, was found to bear to it, the proportion of 5 to 6. This difference in the two experiments arose probably from this, that in the two solutions the action of the diastase had produced more sugar in the one, than in the other. It always results from these experiments, that the interior substance of the fecula, modified by diastase, possesses a power of endosmose, little inferior to that which the sugared water possesses. But, I have shown, in another work, that sugar is of all vegetable substances, that which possesses the greatest power of endosmose. The interior substance of fecula, is modified by diastase, approaches to it under this point of view; its power of endosmose is very superior to that of gum, which after many experiments, I found to be nearly one half that of sugar. Thus, it cannot be doubted that the substance contained in the grains of fecula, does not possess an energetic endosmose when it is modified by the action of diastase. When the teguments of the grains of fecula, are very much distended by the introduction of water, they terminate by bursting. This effect takes place in cold water, as well as in hot water of about 75 degrees, of the Centigrade thermometer, but considerably slower. We know that at a high temperature the diastase decomposes it. When the grains of the fecula have not undergone the action of diastase, the substance which they contain being either insoluble or to a very trifling degree soluble in cold water, there cannot be an endosmose of the product; these grains, in consequence, cannot be forced to burst, but continue to preserve their integrity.

We see also that the separation of the interior substance of the fecula from the teguments under the influence of diastase, is the result of a succession of phenomena. The diastase acts upon this interior substance, as an agent of the modification of composition which disposes it to liquefaction; in virtue of this modification, this substance acquires a great power of endosmose. This last physical action produces the entrance of the water, into the tegumentary vesicle of the grain of the fecula, and renders it turgid, to such an excess that it bursts. This bursting having taken place, the separation of the interior substance of the teguments is worked upon only by the dissolving action of the water. Thus, the diastase cannot act directly by separating the interior substance of the fecula from its envelopes, as the etymology of its name indicates. It would be more eligible to give to this new chemical agent, a name of which the etymological signification might indicate that which changes the chemical nature of the insoluble substance upon which it acts, and which renders it soluble. At length, the name being imposed ought to be preserved, but without any regard to its signification. Science presents many other examples of disagreement between objects, and their names, in relation to the etymological signification, which however are still preserved. The discovery of diastase will claim a high station in the science of physiology. It is a phenomena in organic chemistry, well worthy of serious investigation on account of the rapid change, of the nature and augmentation of solubility, which is produced in an organic substance, by the accession of some atoms of another organic substance, which is neither an acid nor an alkali. This proves to us that when organic substances have

undergone a dissolution, or rather a liquifaction, we ought not at all times to attribute this phenomena to the action of a chemical menstruum. It can be produced by an agent, which we may term diastasier, that is to say at once a transformer and liquifier, without being a menstruum. The phenomena of digestion has certainly received a new light, (which it did not previously possess), from the discovery of this new order of facts in organic chemistry. It is very probable, indeed, that the gastric juice is to the organic alimentary substances, a sort of diastase, which produces the transformation, and occasions the solution of organic alimentary substances. All these organic animal and vegetable substances are composed of agglomerated globules, and these globules which are vesicular like the grains of fecula, are required to be crushed to carry to alimentation the substances which they enclose. There would thus be many gastric species of diastases, in proportion to the kind of alimentation of animals.

The liquifaction of alimentary substances in the act of digestion offers phenomena which it is impossible to explain, by the action of a chemical menstruum. Thus, for example, we know with what facility bones either entire, or in large pieces, are liquified in the stomach of dogs. This liquifaction results from the solution of the gelatine, which re-unites the particles of calcareous phosphate. The bone is then converted into a jelly, better than it could be effected by Papin's digester. This surprising effect cannot evidently be attributed to the action of an acid, so weak as that which is found in the gastric juices.

Let us admit, instead of that, the existence of a gastric diastase, the accession of which modifies the elementary composition of the gelatine, and gives to it a great solubility, and the phenomena of digestion will then become a question easily explained. The bone thrust into the stomach of the dog is quickly liquified, and the gelatine will transform itself into another organic liquid; that will be the act of the stomachic digestion.

After these considerations, we are able to under stand in the action of transformation and liquifaction of the diastase, upon the fecula during vegetation, a sort of vegetable digestion, very analogous to animal digestion.

I have heen long persuaded, that in the study of vegetable physiology, there was to be found a solution of many dark problems in the physiology of animals. The discovery of diastase, and its action upon the fecula during fermentation, strengthens more and more my opinion in this respect.

NOTE UPON THE PLANT WHICH PRODUCES THE STRAW OF THE LEGHORN AND TUSCAN BONNETS.

FROM A LETTER OF M. MERAT, M. D. TO THE EDITOR OF THE ARCHIVES DE BOTANIQUE.

Permit me Sir, in reply to a note in the Archives of Botany, on the subject of the plant which furnishes the straw with which we fabricate in the environs of Florence, the bonnets called Leghorn and Tuscan bonnets, to forward to you the following observations, resulting from the statements furnished by M M. Bonafons, Berlése, the Count de Lasteyrie, &c.

This gramineous plant is a genuine wheat, (*Triticum*) and not a rye (*Secale*) as M. Chaubard terms it; it is a summer corn, a sort of spelt. It is sown in the spring in barren ground, in a dry soil, and cut down before the expansion of the ear. The entire straw (*Sommites*), after having been first bleached in the dew, and afterwards by a chemical process, is employed. There are lands which produce superior straw to others, and of which the middle boles (*Centre nœuds*) are longer, a circumstance which is particularly desirable. The same seed fields in France do not produce such good straw, although the grain answers well. We cannot work this straw so well as they do in Italy, for the manufacturers of bonnets in France, although they may have the straw direct from Florence, cannot produce equally advantageous results. It would appear desirable that this manufacture should be tried on a new system, so that it might prove successful in France; we can bring over workmen from Florence to instruct ours in the culture of the seed and the working of the straw; this would be to introduce a useful branch of manufacture into our country, and which it does not seem impossible to naturalise. The benefit would be considerable, for the price of these bonnets is from 40 to 100 francs, and we have known them cost three thousand francs.

I take this opportunity, Sir, to assert that the bonnets of straw called *de riz* are not manufactured from rice straw; we manufacture them with shavings made with the aid of appropriate instruments, from the Poplar and from the Willow, but not from their bark.

F. V. Merat.

EFFECTS OF MOUNTAIN HEIGHTS ON PLANTS.

Mr. Gay, in his recent interesting tour among the Cordilleras, discovered many beautiful and rare species of *Baccharis*, *Loasea*, *Alstroemeria*, and "above all" he says those "charming *Mutisia* which exhibit this singular phenomenon, the tendrils with which these plants are usually furnished, becoming useless in these cold regions, unprovided with shrubs or bushes, change into real leaves, organs of such great utility to alpine plants, I have also remarked that the plants which are herbaceous in the plains, become here entirely ligneous, and that several trees, especially the *Escaleonia*, instead of assuming that forked appearance which characterizes it, becomes stinted, creeping along the rocks and thus offering less surface to the cold with which the wind is charged in passing over these numerous and immense glaciers. But another observation which I have also made among these cold regions is still more interesting; it is the form of imbricated leaves which the greater portion of the vegetables assume, those genera even whose habitual form seems to be entirely contrary to this disposition. Thus the leaves of the *Triptilions*, which are so lax and small in the lower regions, become here extremely hard and tough, closely imbricating the stalk and even the flowers of these beautiful plants. The *Mutisia* which is nearly devoid of leaves when at the side of the mountains, produces at their summit a considerable number. The violets here have not that elegant form which we observe in those lower down, but are found under a form altogether diferent; they represent a rosette which may be compared to that of a *Sedum*, with this difference, that the leaves, instead of being almost vertical, are in these alpine violets entirely horizontal. These leaves, which are extremely hard and tough, are round, scabrous, strongly imbricated, and exhibit at the footstalks flowers which are sessile, and of a violet colour somewhat approaching to red. Although very familiar with the genera *Triptilions*, *Escaleonia*, *Mutisia*, *Viola*, the particular aspect of these alpine species caused me to mistake them entirely, and I did not discover to what genus they belonged until I studied them after my return."

MR. MAIN'S CATECHISM OF GARDENING.

This deserving little work, which we noticed in a previous number, has at length been completed in the form of a neat little school book, and is published at Ridgways, the great depôt for rural publications. As Mr. Main has had long and extensive practice, and is besides a good observer, and withal a good writer, those who patronize his book may recommend it with all confidence as to the soundness of the directions given. We wish it every success, and as we understand but a very small number of copies have been printed, those who are desirous of seeing it may be disappointed if they delay ordering it at their booksellers, as we should think the demand may be considerable, from its being so cheap.

DESCRIPTION OF THE PLATES.

RIBES SANGUINEUM.

Pentandria Monogynia, Linn; Grossulariaceæ, De Candolle.

Calyx superior in five coloured divisions. Corolla petals, five inserted in the top of the calyx; stamina five, inserted opposite to the petals; anthers compressed, and inclining. Germen, simple; style one; stigmas two; berry round, umbilicated, of one place, containing many seeds.

Leaves heart-shaped of from three to five serrated lobes, linearly veined, rough, above hairy, downy white beneath; branches flexible and nodding; flowers aggregated; petals oblong; bractea ovally spatulate, somewhat longer than the footstalk; ovarium covered with glandular hairs.

The species of Ribes now figured, surpasses every other in beauty. It is a native of North-west America, and, according to Mr. Douglas, Archibald Menzies, Esq. discovered it near Nootka Sound in 1787, when on his first voyage round the world; and on his second voyage with the celebrated Vancouver, he found it again in various parts of North-west America. From the time of its first discovery until its introduction in 1826, comparatively nothing was known of it in this country; but in that year it was cultivated in the Horticultural Society's garden.

It is perfectly hardy, and nearly as easy of culture as the common currant bush of our kitchen gardens; it requires to be planted in a dry situation and a light soil, when it produces abundance of beautiful purplish-red flowers about the beginning of May, and continues flowering for two or three weeks successively. It is increased by cuttings, after the manner of the common currant, which should be planted in light sandy soil, either in September (which is probably the best time) or in spring. The colours of this, as well as many other plants, are subject to considerable variation, some bearing flowers of a light rosy colour, others of a dark carmine, and others with deep purple tints.

BORONIA PINNATA.

Octandria Monogynia, LINN.

Calyx quadrupartitus. Petala 4. Antheræ infra apicem filamentorum pedicellatæ. Stylus ex apice germinis, brevissimus. Stigma capitatum. Capsulæ 4. coalitæ. Semina arillata.

Calyx in four divisions. Petals four. Anthers on footstalks, below the summits of the filaments. Style from the top of the germen, very short. Stigma capitate. Capsules four, united, seeds tunicated.

Foliis impari pinnatis integerrimis, pedunculis axillaribus dichotomis, filamentis apice obtusis glandulosis.

LEAVES abruptly pinnate, flower stalks axillary, forked. Summit of the filaments obtuse and glandular.

A smooth shrub, near two feet high, with many wand-like, roundish, leafy branches.

Leaves opposite, rarely three together, without stipulæ, composed of from three to five pair of sitting, lance-shaped, pointed, entire, smooth, somewhat succulent leaflets, with a terminal one like the rest, though often rather smaller; the common leaf-stalk, is joined, channeled and winged.

The elegant flowers arise from the bosoms of several of the uppermost leaves, in solitary corymbose forked clusters, and are of a rose colour, smelling like hawthorn blossoms.

Stalks angular, with a pair of small pointed bracteæ at each divarication.

Calyx small, reddish and smooth.

Petals four times as long as the calyx, spreading, darker on the outside, slightly acid.

Filaments red, fringed with white hairs to the very top, which terminates in a blunt glandular protuberance, sometimes slightly hairy also, into the base of which on the inside is inserted a slender short smooth little footstalk, bearing the anthera, which is oval, smooth, incumbent, bursting by two longitudinal fissures on the other side.

Germen small, smooth, four-lobed; style short, hairy; stigma blunt, with four furrows.

Capsules smooth.

Seeds solitary, black, enclosed in a white polished two valved elastic case.

This species flowered for the first time in Europe, at Messrs. Lee and Kennedy's, in the spring of 1795. It is treated as a rather tender green-house plant.

BORONIA SERRULATA.

Foliis trapeziformibus acutis antice inæqualiter serrulatis, pedunculis aggregatis terminalibus, filamentis apice cordatis luspidis.

LEAVES rhomboid, pointed; in the upper part minutely and unequally serrated. Flower-stalks clustered terminal. Summit of the filaments heart-shaped bristly.

This is a very beautiful shrub, rising to the height of about four feet; the stem variously branched and subdivided; round, smooth, with a deciduous cuticle; the younger branches clothed with leaves, and terminated by flowers.

Leaves without stipulæ, opposite, nearly sitting, but little spreading, somewhat oblique, rhomboid, pointed, entire towards the base, finely, sharply, and unequally saw-toothed towards the point, without vein or rib, punctuated with resinous dots, aromatic, with a smell approaching to that of turpentine. Their colour is a fine green, often with a purpleish tinge.

Flowers in little terminal somewhat corymbose clusters, of a beautiful red, and with the scent of a rose, as we are informed by Mr. White, who mentions this shrub as one of the most admired in New South Wales. They are a little larger than those of the Boronia pinnata.

Bracteæ opposite, lance-shaped, concave, pointed, often downy in the margin.

Calyx red; its segments egg-oblong, pointed, slightly keeled and ribbed, permanent, the two opposite ones external, the margin of all slightly downy.

Petals thrice as long as the calyx, spreading, egg-oblong, rose-coloured with darker stripes, acid.

Filaments red, fringed with white hairs at the base, more naked above, but terminating in a globular notched protuberance, (less conspicuous in the four shorter stamina) which is thickly covered with white projecting hairs or bristles, the anthers being inserted on footstalks, just below it, and shaped as in the preceeding species.

Germen small, four-lobed; stigma nearly sitting, large, conical, blunt, smooth, slightly four-lobed.

Capsules smooth, sprinkled with resinous dots.

Seeds two in each case, of a shining black.

SPRENGELIA INCARNATA.

Pentandria Monogynia, LINN.

Calyx quinque-partitus, peristens. Petala quinque. Stamina receptaculo inserta. Antheræ connatæ. Capsula quinque-locularis, quinquevalvis; disepimentis e medio valvularum.

Calyx in five divisions, permanent. Petals five. Stamina inserted into the receptacle. Anthers united. Capsule with five cells, and five valves; partitions from the middle of the valves.

CALYX a part of the flower, in five deep divisions, so as to be almost composed of five leaves, chaffy, coloured, permanent, segments equal; lance-shaped, pointed, concave; after flowering, erect and closed together.

Petals five, about as long as the calyx, lance-shaped, pointed, cohering a little way above the base, in the upper part spreading, and assuming the appearance of a wheel shaped corolla; after flowering, erect and closed together, soon falling off.

Stamina five, the length of the petals; filaments inserted into the receptacle, distinct, line-like, flat, equal, smooth; anthers vertical, united into a tube, clothed externally with numerous yellow club-shaped hairs.

Pistil; germen superior, roundish, depressed,

with five furrows, smooth; style simple, about equal to the top of the anthers; stigma simple, blunt.

Capsule somewhat cylindrical, blunt, with five furrows, separating in the upper into five valves; partitions longitudinal, arising from the middle of each valve; column a little rugged, shorter than the valves.

Seeds numerous, roundish, minute.

This is a shrub, about two feet high, much branched, rigid, very smooth, flowering copiously. Wood hard, white. Branches round, wavy, leafy, brown, cracked when old.

Leaves alternate, sometimes tiled in three ranks, embracing the stem, spreading very much, lance-shaped, entire, concave, a little glaucous, without veins rigid and projecting, remaining (though faded) through the winter, and at length being loosened at the base, they may be turned round in any position.

Stipulæ none.

Flowers terminal, clustered on flower-stalks, pale red.

Flower-stalks clothed with tiled bracteæ like the leaves, but smaller, and with a membranous and fringed margin, clustered under each flower.

Calyx rose coloured, very rarely a little downy on the outside.

Corolla, flesh-coloured.

WESTRINGIA ROSMARINIFORMIS.

Didynamia Gymnospermia, Linn; Labiatæ, Jussieu.

Calyx semiquinquefidus, pentagonous; corolla resupinater; limbo quadrifido; lobo longiori erecto, bipartito.
Stamina distantia; duo breviora (inferiora) abortiva.
Calyx five-cleft half way down, five-sided; corolla reversed; limb in four segments; the longest erect, cloven.
Stamina distant; the two shorter or lowermost, abortive.

A shrub very much branched; the branches either opposite or four together, square, silky, leafy.

Leaves in fours, on foot-stalks, spreading, line-like lance-shaped, entire, revolute, rather pointed; of a bright shining green above, and almost naked; clothed with white silky down beneath.

Foot-stalks very short, silky. Stipulæ none.

Flowers from the upper part of the branches, axillary, solitary, on short flower-stalks.

Bracteæ a pair at the base of the calyx, line-like, short, silky.

Calyx silky, its segments naked, with revolute margins.

Corolla white, with purple spots about the orifice.

We are not informed of any particular qualities in this shrub. The leaves are slightly bitter, not aromatic: the flowers not inelegant, though without smell.

WISTARIA FRUTESCENS.

Diadelphia Decandria, Linn; Leguminosæ, Jussieu.

This plant is a native of North America, and was introduced into this country in 1724. It is in height about ten feet, and flowers from June to August inclusive.

It is a very beautiful climber, which, like its congener, Wistaria consequana, formerly Glycine Sinensis, spreads more slowly through English gardens, than in these days of botanical vigilance would be imagined. Their having been known as green house plants, seems to have formed a bar to the extension of their acquaintance as hardy climbing shrubs. The Wistaria futescens is, however, perfectly so, and from its great beauty should have a place in every garden. It is more hardy than Wistaria consequana, and its flowers being produced later in the season, they are less liable to injury from spring frosts.

Planted in loam and peat, against a southerly wall, it will grow very freely, and the cultivator may expect to be highly gratified by its rich display of beautiful flowers. It is usually propagated by cuttings of the young wood, planted in sand, or very sandy compost, on a hot bed, under a hand-glass.

GENTIANA CRUCIATA.

Pentandria, Digynia, Linn; Gentianeæ, Jussieu.

This low free-growing herbaceous plant, is well adapted for ornamenting the fronts of borders and mounds; but it has not the advantage of some others of the same genus, in affording an evergreen embellishment of bright green leaves to enliven the little garden landscape of winter.

It will grow in any common soil, and seems to prefer a rather cool and moist situation. It may be divided in spring or autumn.

GERANIUM LANCASTRIENSE.

Monadelphia Decandria, Linn; Geraniaceæ, Jussieu.

The genus Geranium, is now confined to such of the plants, originally so called, as possess ten perfect stamens. By such division, all those beautiful subjects, generally known by this name, which have been cultivated in the green-house, or more intimately domesticated in the dwelling-house, form another genus, under the name of Pelargonium. These have but seven fertile stamens.

Geranium Lancastriense has, by some authors, been considered a variety only of Geranium sanguineum. The union of it to that species would do no violence to botanical description, but its general habit, and permanence of character, under cultivation, incline us to follow nature rather than science in the distinction. It is a very desirable little plant, always in flower during summer.

It may be readily increased by cuttings, planted under a hand-glass, on a shady border.

1 Gonolobus diadematus.

2. Crotalaria retusa

3. Digitalis lutea

4 Polygonum frutescens

5. Erica australis.

6. Epilobium Dodonæi.

7. Lilium tigrinum.

8 Tagetes patula

MARTIN DOYLE ON FLOWER GARDENING*.

This popular and sensible author has a right feeling about him respecting the language of gardening, and uniformly advocates as we do, plain English in preference to the outlandish words which have lately been so much forced into fashion, by illiterate pedantry and cockscombry. The Editor of this Magazine has elsewhere remarked, that for practical gardeners to affect hard words, appears exceedingly injudicious, as it must prove extremely injurious to themselves by deadening, rather than exciting, interest about the garden. If you talk to a lady, for example, or even to most gentlemen, about *Endogenous* plants, it is most likely it would be placed to your ignorance of the proper pronunciation of the word *indigenous*, rather than obtain you credit for a knowledge of De Candolle's system; but, if you interlard your conversation with the terms *Monocotyledonous*, *Dicotyledonous*, and the like; though you might perhaps with a little management, make such useless outlandish terms as *Arboriculture*, *Floriculture*, and *Gardenesque*, pass muster, and might be allowed to call herbs, *herbaceous plants*, and flowers, *florifcrous plants*; yet you may be certain you will either be listened to with impatience, or, most probably be laughed at for your affectation of unprofitable learning, as we once saw happen to a prim barber at a fashionable watering place, who deemed it very fine to talk of an "*elegant* morning."

Certain peculiarities of language readily produce imitation, and are so very contagious, that we doubt not many have been led to frequent the society of gamblers and boxers mainly on this account; but such peculiarities are contagious, because they are easily learned. As prince Henry, in Shakspear says, "they call drinking deep *dyeing scarlet*; and I am so good a proficient in half an hour, that I can drink with any tinker in his own language during my life." But so far from the terms used in modern gardening being thus easily learned, they are peculiarly difficult and calculated to disgust, rather than attract the interest of proprietors, and hence their attention to their gardens must be frequently diverted into other channels, and the gardener consequently deprived of their hearty support, because he talks unintelligibly, and therefore not contagiously.

"The arts," says Sir John Herschel, "cannot be perfected till their whole processes are laid open, and their language simplified and rendered universally intelligible. Art is the application of knowledge to a practical end. If the knowledge be merely accumulated experience, the art is empirical; but, if it be experience reasoned upon and brought under general principles, it assumes a higher character, and becomes a *scientific art*. In the progress of mankind from barbarism to civilised life, the arts necessarily precede science. Applications come later, the arts continue slowly progressive, but their realm remains separated from that of science by a wide gulf, which can only be passed by a powerful spring. They form their own language, and their own conventions, which none but artists can understand. The whole tendency of empirical art, is to bury itself in technicalities, and to place its pride in particular short cuts and mysteries known only to adepts; to surprise and astonish by results, but conceal processes. The character of science is the direct contrary. It delights to lay itself open to inquiry; and is not satisfied with its conclusions, till it can make the road to them broad and beaten; and in its applications, it preserves the same character; its whole aim being to strip away all technical mystery, to illuminate every dark recess, and to gain free access to all processes, with a view to improve them on rational principles. It would seem that a union of two qualities almost opposite to each other—a going forth of the thoughts in two directions, and a sudden transfer of ideas from a remote station in one, to an equally distant one in the other, are required to state the first idea of applying science."

In all this Mr. Martin Doyle agrees with us to the letter, and even a little beyond the letter, as Sir Vicary Gibbs was wont to do by the law, when he had things almost his own way. We have generally observed, that those who are the most ignorant of facts, are the fondest of long sounding pedantic words, and those also who know least of the pedantic words, are most apt to thrust them prominently forward, where they are least wanted.

"I must be permitted," says our author, "to exclude very harsh words—those among you, who most admire, and best understand the noble science of Botany, will, nevertheless, admit that a minute application of it in a compendious work of this nature, would be unsuitable and diffuse. Extensive catalogues and botanical delineations might, indeed, be introduced; but each additional page adds to the cost of publishing, and of course to the price of the book—this is to be of limited extent and price, and should be dedicated to practical matters, rather than to the *Decandrias*.

"Few ladies understand Latin and Greek,—(and the fewer the better,) some may guess at the *Latin* from their knowledge of Italian, (which I have been told is very like it,) but when the *Greek* comes across them, they are fairly baffled, and might get into a similar scrape with my old friend *Caukerosus*

* The Flower Garden; or Monthly Calendar of Practical Directions for the Culture of Flowers. By Martin Doyle, 12mo. Dublin. 1834.

in the preface to my former treatise. As for myself, I must confess my deficiency in the knowledge of any language except my own, and a *smattering* of Irish: nevertheless, I should be sorry to make my fair readers submit altogether to *my* ignorance, and where it may be necessary or useful to adopt scientific names, I shall not scruple, for their sakes, to call in the aid of an obliging friend, who is a great adept in those matters, and on whose taste I must depend for the arrangement of the *nosegay* which I am about to present. But, my dear ladies, let us be *practical* and plain, and leave all high-flown matter, however interesting in point of science."

We by no means agree with him in the books which he recommends; inasmuch as these are decidedly the very reverse of plain and intelligible; while one of them is only half published, and likely, we hear, to stop altogether. But leaving this out of consideration, let us see in what manner Mr. Martin Doyle treats the subject of his new volume,—if the neat *brochure* before us be entitled to that name. As we have formerly seen in the case of the kitchen garden, our author here follows the order of the calendar months, beginning with November as the most natural commencement of the gardener's year. We shall give the present month, July, as a specimen of the book:—

JULY.

Work to be done in the Flower Garden.

Take up those bulbous roots which have ceased flowering—Hyacinths, Tulips, Martagon Lilies, and such bulbous Irises as are out of flower, Ranunculus and Anemonie roots, which have now lost their foliage, may also be taken up.

Seedling Auriculas

Which came up last spring, should now (if not before done,) be potted, and placed in a shady situation, watered moderately, and kept free from snails and slugs.

Carnations and Pinks.

This is still a good season for propagating these charming flowers, by either of the modes directed in June; but this work should not be postponed to an advanced period of the month. As soon as the shoots are strong enough to layer down, let them be put out.

The latter end of this month and beginning of August is the usual season for layering Carnations, which, however, may be done earlier, if the plants are sufficiently advanced in growth; the new plants from those early layers will be more vigorous, and better able to endure the severity of winter, than those of a later season. In detaching them, it will be necessary to cut them close under the joint from which the roots have been produced, and from which the tongue had in the first instance been cut; the young plants may now be potted, and with the shelter of a frame, will in a few days be sufficiently established to bear exposure in the open air. In the space of a few weeks it will be found that layers thus treated, will have formed a quantity of root from the other half of the joint, where they had been attached to the parent plant; and they will not only be equally sound and healthy, but much more luxuriant than plants produced by piping.

The operation of layering is very simple, and is done by first stripping the leaves from the second or third joint of the intended layer, then introducing the blade of a very sharp penknife at about a quarter of an inch under the joint, and cutting half way through the layer *up* to the joint, but *not into* it; the knife is to be then drawn out, and the tongue so produced, cut away neatly under the joint, but so as not to wound it, or the layer will not root. The future fibres or roots of the new plant proceed from the joint itself, therefore any injury to it will prevent their formation. The old mode of cutting up through the joint is not only useless, but injurious, causing an unsoundness and canker*, which, although the layers may have rooted, will probably destroy them during the winter; the layers are then to be pegged down (with care not to crack them at their junction with the mother plant) and thinly covered with light rich compost; for if they are deeply buried, they root badly and with difficulty, the access of air being necessary to promote the free production of fibres: the points of the leaves of the layers must be preserved uninjured, and not cut off or shortened, as is the usual practice, or you will deprive the plant of a necessary means of support, the leaves of plants being as essential to their vitality, as lungs are to animals. In five or six weeks from the formation of your layers, they will be rooted, and may be removed from their parent stems.

The Carnation blossoms are now advancing fast to maturity; those which are very double and inclined to burst, should have the flower pods either tied neatly with bass mat, previously wetted, or supported by circular cards, with holes punched in the centres, to fit the pods; and these should be cut (with a very sharp penknife) through each of their divisions to the base, taking care not to injure the petals. This process permits the flowers to expand evenly, and the cards not only preserve the blossoms

* For this reason, plants produced by piping are preferred, being more healthy and sound.

in their natural form, but also aid materially in increasing the duration of the bloom. The Carnations, if in beds in the open ground, and unprotected by canvas or other substantial covering, should have their blossoms guarded from the sun and rain, by umbrella-shaped pasteboard shades, which may be attached to the stakes supporting the blossoms; but if this cannot be conveniently done, they should be fixed to pieces of slit lath, placed in the ground in the most advantageous positions to afford shelter to the blossoms.

Mignonette.

If you desire to have Mignonette in blow at the latter part of the floral season, you ought to sow it now.

Roses, Jasmines.

The layering and budding of Roses and other shrubs may now be performed. Some species of the Rose do not freely yield suckers, and must therefore be propagated by layers.

The stocks for budding may be taken from the suckers of the most common kinds. The common dog-briar, from its superior vigour, is the most desirable stock. Jasmines are principally propagated by budding, and the common white kind is the most usual stock.

Propagation of Chrysanthemums.

The suckers which at this season have attained the height of twelve or more inches, may be now parted and planted in separate pots, in a compost of equal parts of leaf mould, garden soil, and rotten dung; they will make fine blooming plants for November or December; when they are strongly rooted, cut away the centre or leading shoot, to let the plants push out side shoots, and form a bushy and well-shaped head, while they at the same time preserve the dwarf size, which is desirable, if the plants are grown in pots.

Cuttings rooted early in the month, with a little bottom heat, will also make pretty dwarf growing plants to flower in autumn.

Treatment of Dahlias.

These are now coming into flower, and will require the support of hoops, or of the triangular sticks described in the preceding month.

The general work of this month consists principally in watering and tying up plants, and in weeding.

Work to be done in the Green-house.

Syringe and water Camellias and Oranges frequently, and shade them from hot sun.

Plants potted in peat, (as are most of our Cape and Australian ones) should be carefully examined every day, lest they should become too dry; for peat is so little retentive of moisture, that they will require frequent watering.

Take cuttings of your green-house plants, if you have not taken a sufficient supply in June, and plant them in a bed, shaded during the day by the hoops and coverings already recommended.

The *very tender* succulent ones should have a mild hot-bed, but all the Geraniums, Myrtles, Jacobeas and Cape shrubs, will freely root themselves in a bed of rich earth in open air; exposure to nocturnal dews in either case is desirable.

Remove insects from the leaves, which are now peculiarly liable to injury from them.

Give abundant air to the green-house.

Shift seedlings accordingly as their growth requires it, from smaller to larger pots; water and *shade them*, until they have rooted.

Exotic Seeds.

Gather and save seeds as they become ripe, and spread them in dry places to harden; afterwards preserve them in their pods.

The most ornamental Herbaceous Plants in flower.

Double Rose Campion, Hollyhocks, Spiderwort, Campanulas, Scarlet Chelone, Blue Catananche, Dragon Head, Rudbeckias, Coreopsis, Gentian, Erynga, Spiræa trefoliata, Perennial Sunflower, Hemerocallis, Iris, Lilies (White, Orange, and Martagon), Lilium Japonicum, Verabrum, Phlox (of various sorts), Escholtzia, Cardinal Flower, Monkey Flower, Œnothera, Monarda, Potentilla or Cinque Foil, Penstemon, Feather Grass, Verbascum, German Catchfly, Scarlet Lychnis, Scarlet Geum, Perennial Larkspur, Blue Catananche, Dahlia, Menyanthes, Campanula Pyramidalis, Gladiolus Cardinalis, Nolana, Lupinus, Polyphyllus, Potentilla, Lathyrus grandiflorus, Sea Holly, Water Lily, Ixia, Stapelia, Gladiolus Psittacinus.

Ornamental Green-house Plants in flower.

Sensitive Plant, Nerium Splendens, Escholtzia Californica, many Ericas, Acacia, Wax Plant (Hoya Carnosa), Double Red and Double White Lily, African Lily, Agapanthus, Begonia, Evansiana, Commelina, Gardenia, Melaleuca, Neurumbergia

Phœnicia, Double Pomegranate, Psidium Catleyanum, Cape Trumpet Flower (Bignonia Capensis), Tuoma Capensis, Single Oleander, Double Red and White Oleander, Verbenum, Fuchsia, Calceolaria, Double Nasturtium, Metrosideros, Jasmine, Melaleuca, Chironia, Agapanthus, Balsams, Ice Plant, and the whole tribe of tender Annuals.

Shrubs.

Roses*, Yellow Broom, Spanish Broom, Aristolochia (a beautiful Climber), Azalia, Rhododendron, American Canothus, Virginian Ilex, St. John's Wort, Cytisus Capitalis, Double Bramble (White and red), Lupine tree, Menziesia, Buddlea, Myrtles, Jasmines, &c.

Climbers.

Japan and Chinese Honey-Suckles, Passion Flower, Clematis, Eccremorcarpus.

We can with confidence recommend the work to all those who amuse themselves, and improve their taste, by rearing flowers.

ON THE FORMATION AND STRUCTURE OF THE SPORES IN CRYPTOGAMOUS PLANTS.

BY M. HUGO MOHL, M.D.

Authors have endeavoured to compare the spores of cryptogamous plants to the seeds of phanerogamous plants, attributing merely a more simple structure to the former. One of the chief causes of the numerous errors committed in this view of the subject arises from the spores not being examined at the first moment of their evolution. Recent experiments have taught us, that we cannot have a correct knowledge of this structure, except by a minute investigation of the nascent seed *(Ovulum)*. Now, M. Mohl has shewn that it is also necessary to follow this rule in cryptogamous plants; but there is a great difficulty in this examination arising from the organs of fructification in these plants being so very small.

The author has chosen, in commencing his experiments, a plant which presents these organs of a large dimension: it is the *Riccia glauca*. Its receptacle (*sporangium*) is globular formed of longish cells, with thin coats full of the germs of chlorophyll; it is concealed in the leaf *(frond)*; when it begins to develope itself, it is found full of globular vesicles, formed of a thin and colourless membrane. These vesicles inclose a thick and granular liquor, that separates itself slowly into four parts, whence it covers itself with a very thin membrane. By the pressure that these four small parts exercise mutually the one upon the other, their forms become that of a pyramid, blunt and three angled; the face turned against the sides of the vesicle becomes convex. The author imposes upon this the name of the tetrahedrous union (*tetraëdrische vereinigung*). As the granules attain the size of the spores and come to maturity, the shells in which they are formed disappear entirely, at a point where we can discern no trace of them; at the same time it produces upon the exterior of the thin and uniform membrane which covers the spores, another membrane formed from the small cells, which takes at its maturity a dark brownish tint. The substance enclosed in the spores then becomes oily.

The same phenomena are observed in the spores of *Anthoceros*. Among the mother cells is found a net of saw-toothed longish cells. These form, when they become shrivelled, after the disappearance of the mother cells, the bodies to which Hedwig gives the name of *Elateres* (spore-hairs). In the *Anthoceros*, however, this organ does not present a point, as in the *Jungermanniæ* and the *Marchantiæ*, threads spirally twisted, which the author terms mother cells *(Mutter-Zellen)*. The examination of the large species of the genus *Jungermanniæ* presents a structure similar, in all respects, to that of *Riccia*. As the spores not evolved are found in the mother cells, the spore-hairs *(elateres)* are presented under the form of spindle-shaped cells, of which the interior is filled with very small granules of starch; these granules disappear about maturity, and the spore-hairs *(elateres)* are presented under the appearance of threads in a spiral form. This observation demonstrates the error of those who have believed that they have seen each spore attached to a spore-hair as in the *funicle*. In the *Jungermanniæ epiphylla*, the spores united in four, differ from the ordinary form in that they are egg-oblong, and in that they do not touch except in one part of their surface. The granules enclosed in the spores, not yet mature, are of a green colour, as in the other species of the same genus. The figures which M. Corda has published in the Flora Germania of Sturm, the *Marchantia*, *Grimaldia dichotoma*, *Consinia*, *Targiona*, *Blasia*, and the like prove the identity of the structure of these plants with those examined by Dr. Mohl.

The Ferns are very similar to those plants which we have just had under consideration. The young

* Although the greater part of the Rose tribe flowers has passed away with the last month, there are many varieties of the Chinese, Bourbon, Musk, and Damask species, still in bloom.

Capsule is, like that of *Riccia*, entirely filled with round mother cells. Towards maturity, these mother cells disappear, and the spores occupy the interior of the capsule, without being as yet fastened among them, and without presenting much of an enveloping membrane, which is found to cover very slowly a second. This new membrane, however, does not in all the species present the same structure. In some, it is formed of very small distinct cells; in others, it presents an organization entirely homogeneous; behind them is covered the granules in form of papillæ in the *Pteris crispa*, *Davallia canariensis*, *Osmunda regalis*, *Polypodium vulgare*, *P. aureum*, *P. calcareum*, *P. rhæticum*, and *Cheilanthes odora*. In other species, these granules are prolonged into small needle-formed bodies, as in *Aspilnium Breynii*, *Polypodium Lonchitis*, *P. aculeatum*, *P. fragile*. In others, in fine, they are fastened and extremely small: as in *Struthiopteris*, *Doodia aspera*, *Polypodium filix-fœmina*, *Pteris atropurpurea*, *Pt. longifolia*, *Pt. serrulata*, *Pt. cretica*, and *Acrostictrum alcicorne*. A great number of Ferns exhibit the spores in three angled pyramids rounded at their base; in others, these present a different form somewhat oval, proceeding from their position in the mother cell. It is evidently the fact, that the form which the spores ordinarily assume, is owing to the pressure they exercise the one against the other. In *Osmundaceæ*, the author has found the structure of the *Polypodiaceæ*; for example, in the *Osmunda regalis*, and *O. speciosa* Wall; *Mertensia gigantea*, *Gleichenia microphylla*, *Lygodium polymorphum*, and *Mertensia pubescens*. At the same time, four species of *Anemia* examined by M. Mohl, presented a structure of the spores a little different. The examination of the *Lycopodiaceæ* presented entirely similar results. In the *Lycopodium Selago*, the capsules ought to be examined two years before their maturity, while they are still imperceptible to the naked eye. The mother cells swim in a mucilaginous and granulous liquor, and resemble small vesicles. The following year, the mother cells have filled already the whole cavity of the capsule, and the surrounding liquor has disappeared. We can already perceive sometimes the four parts of the tetrahedrous union separated. The author notes also the differences to be observed in the structure of the envelopes in the different species of *Lycopodia*.

The reproductive organs of *Marsilea* and of *Pilularia*, are produced equally by four in the mother cells which disappear more slowly; they are envelopes of two membranes, and are filled with an oily and grumous substance. Without venturing to decide upon their true nature, the author is clearly of opinion that they cannot be considered as grains of the pollen, since at the perfect maturity of the spores they are still enclosed in cavities, which are termed anthers, and which do not present any change analogous to those which occur in the *Phanerogamia*, at the epoch when their fecundating functions are terminated.

The same uncertainty continues to govern the functions of the analogous granules of *Isoetes*. According to the observations of Wahlenberg, the two species of granules are developed by four in the mother cells. The *Salvinia* presents on analogy sufficiently far from the spores of *Marsilea* and of *Pilularia*. The *Equisetaceæ* show a still further removal.

The spores of the Mosses grow in a similar manner with the cells of the *Hepaticæ* and of the Ferns; but to discover these we ought to proceed to an examination of the capsule in its early growth. The *Splachnum gracile*, for example, examined at the period when the capsule-bulge (*apophysis*) commences only to inflate itself, presents the spores already disseminated between the pillar (*columella*) and the interior membrane of the capsule. A very thick liquor shows the nascent state of different parts shut up in the capsule; the manner in which these are composed is described in detail. The author has been able to convince himself with certainty, that in this Moss the number of spores enclosed in one mother cell cannot be more than four. He has seen distinctly that which he calls the tetrahedrons union in the *Neckera viticulosa*, *Polytrichum aloides*, *Orthotrichum crispum*, and the like. The excessive smallness of the greater part of the spores of Mosses opposes a serious obstacle to a correct acquaintance with their structure. This inconvenience disappears especially in the *Meesia uliginosa*, where these present an outer coloured membrane, translucent, grumous, easily detaching itself; the interior membrane being very thin and colourless.

The spores of the Mosses are developed in a hollow of the pillar (*columella*). Here the author adds some observations upon this latter organ. Palisot de Beauvois has admitted that the spores of Mosses formed in the interior of the pillar (*columella*), and that the granules placed between the pillar and the interior capsular membrane, ought to be considered as the pollen.

M. Mohl enters very minutely into the interior structure of the capsule; he demonstrates the homogeneity of the interior capsular membrane, and of the pillar. He admits besides of the resemblance between this membrane and the interior brim, (*peristoma*) of certain Mosses.

The author still continues to speak of the formation of the spores in the *Lichens*, with the intention in a second memoir to treat of the less perfect cryptogamous plants. If in their organs of fructification the Lichens present that which the author calls mother cells, there however exists this difference, that in the shields (*scutella*) of the Lichens, these cells do not develope themselves, nor are they all

ripe at the same time; they are not effaced at the maturity of the spores; they exist still after the entire evolution of these, and replace in some degree the receptacle (*sporangium*) which is wanting in the Lichens; their walls besides are very thick. The mother cells are in the beginning full of a thick grumous mass, which undergoes a slow change into spores with a very thin membrane; but the number four is no longer observable; they are much more numerous in each cell, ordinarily they are to the number of eight; in the *Usnea barbata*, the cells are simple, they are composed of cells united in a straight line, and to the number of two in the *Borrera ciliaris*, of four in the *Peltigera resupinata*, and six in *P. rufescens*, from twelve to sixteen in *Arthonia mellosa*, Eschweiler. It appears general, that in this family the number of cells which constitute one mother cell, are the multiples of four, namely: 8, 16, 32 (64?), 96, 128. Ordinarily the spores are so very small that we can make no correct examination of their structure. They appear formed of a thin interior membrane, colourless, and of another external, sometimes slightly granular. Frequently they enclose a drop of oil, which we find sometimes, (as in the *Borrera ciliaris*,) across the membrane which covers it.

At the conclusion of this exposition, the author traces a parallel between the spores of cryptogamous plants, and the nascent seeds (*ovula*) of phanerogamous plants, such as these observations have a tendency to explain. These are the more important results of this comparative examination; if the nascent seed (*ovula*) of phanorogamous plants is by reason of its verge (*trophosperm*) much more a scion than a real egg, it is not the same case in the *Cryptogamia;* their spores are developed independently of the capsular wall, they swim in a liquor with which the cavity is found to be filled; they do not show any organic structure, and they acquire but by slow degrees a distinct individuality.

Their affinity with the animal egg is then very conspicuous. The intimate conformation of the spores does not present the less difference; the membranes in which they are enveloped grow only after their contents; this last, however, the development of the membranes, lose all organic structure and changes itself into an oily liquor, in which there cannot be discovered the slightest trace of future plants. We see then, that the spores do not lead by any means to the comparison, either with the entire seeds of phanerogamous plants, or with some one of their parts. The opinions of Treviranus, of Fischer, and Agardh on this subject, are refuted by M. Mohl. He equally rebuts in a lengthened detail, the theory of Turpin and Raspail on the development of vegetable matter. If we bring forward an organ of phanerogamous plants with which we can compare the spores of cryptogamous plants, we find that the development as such that the conformation of these last present a greater analogy with the organization of pollinic granules. The pollen, like the spores, developes itself in the interior of the cells which disappear at its maturity. We find the same numerical relations in them, the greater part of phanerogamous plants present the tetrahedrous union; rarely their pollen is in a parallel position; interior, tender, uniform; the exterior of a large consistence, sometimes cellular, sometimes granular, smooth, or well covered with needle-formed bodies. We know that M. M. Turpin and Agardh have considered the spores as the grains of the pollen, and they attribute to them in a series of the vegetable creation of male functions, and in the other of female functions. M. Mohl combats these errors, and the contradictions that these explications present as to the morphological analogies proposed by Agardh in his Biology of plants; and he terminates his important memoir in indicating the differential points depending in the germination of seeds, and development of spores. The two plates which accompany the memoir of M. Mohl, are very well executed, and greatly assist the understanding of the reader.

SCIENTIFIC PRINCIPLES OF FALLOWING.

From the Editor's Hand Book of Allotment of Agriculture.—Just Published.

Fallowing, is the ploughing or digging successively for six or nine months, without having any crop on the ground. The effects of fallowing, are founded on the same principles as that of the rotation of crops. The slimy excrementitious matter, left in the soil by previous crops, being exposed by turning it up to the sunlight, and the passing air becomes decomposed, or exhaled in the form of vapour.

This simple explanation, gets rid at once of all the various conflicting opinions about the effects of fallows. The only plausible advantage of fallows, usually stated, is the getting clear of weeds; but this is a very minor matter, compared with the expulsion of the excrementitious slime. It will also, on the principles now I believe published for the first time, be evident, that what is termed a turnip fallow, is as absurd in principle, as it has been found to be bad in practice; for no sort of crop which keeps sunlight from the ground, can ever answer the purpose, though it may help to clear away weeds; and, for the same reason, one week of bright summer sunlight, is worth ten of winter exposure.

NEW RESEARCHES UPON THE STRUCTURE OF THE OUTER BARK (EPIDERMIS) OF PLANTS.

By M. Adolphe Brongniart.

The outer bark which covers the several organs of plants, and particularly the leaves, has already been the object of numerous observations, because this outer bark presents rather a complex structure, and because all those who study vegetable physiology have felt that the exact knowledge of this their outer bark, is very important in estimating the mode of action in the organs which it covers.

In a former essay upon the anatomy of leaves, I quoted the principal opinions of botanists upon their structure, and advanced some new observations in support of that which considers the outer bark (*epidermis*) as a simple layer of utricula, differing by their form from those which compose the subjacent parenchyma, without any mixture of vessels, and present from distance to distance the coverings which form the stomata.

I have lately observed, however, that by maceration we can separate from the surface of the leaves of the cabbage, a very fine pellicle, without any sign of cellular organization, and in which the stomata do not appear any thing more than as simple coverings in form of a button-hole.

At this moment, not having leisure to repeat this observation on other leaves, and after a maceration more or less prolonged, I have hesitated to admit this pellicle as a component part of the outer bark of all plants; but I have already remarked, as many of the figures which I have published, lead to the conclusion, that the utricula, which, disposed in a single layer, constitute ordinarily the outer bark, present a thicker coat on the external surface than on the other sides, such as may be conceived by their union with a simple pellicle, that would have covered them externally.

Desiring to elucidate this question, I renewed these observations during the summer of 1832; I examined, by maceration, a great number of leaves of monocotyledonous and dicotyledonous plants, and I convinced myself, by this procedure, of the general existence of a very fine superficial pellicle, which covers the external surface of the cellular layer of the outer bark.

It is sufficient to be convinced of the existence of this membrane and its independence of those utricula, which constitute the more internal layer of the outer bark, to macerate leaves in pure water for a longer or shorter time, according to the nature of the leaf and the state of the atmosphere.

In examining from time to time the leaves in such a state of maceration, we can easily perceive that the parenchyma alters first, the outer bark is detached and is raised; but at this epoch there is sometimes no sensible difference from that which takes place mechanically upon the fresh leaf; but in general it becomes a little less transparent. In fine, sometimes in five or six days, but more frequently in ten or twelve days, we can easily, with a needle, derange, scatter, and completely raise the utricula, which, by their drawing nearer, formed the very varied net-work of the outer bark.

We know that, in general, these utricula form only a single layer; but following the species, they are formed very different; in monocotyledonous plants, with parallel ribs, they are lengthened, and have parallel edges; in dicotyledonous plants they are generally angular, and at the edge they become sinuous. When these utricula are thus detached by maceration, they still perfectly preserve their primitive form, only the angles are rather round, and the flat surfaces which terminate them when they have become intimately united among these, are found more or less convex.

These utricula are for the most part completely transparent and without any trace of organized matter in their interior; in other cases, we can discover sometimes small irregular granules.

The detachment of these utricula of the outer bark is effected with the same facility when this membrane is formed of many layers of cells.

After having thus raised these utricula, we see that there remains a very small continuous membrane which forms the external surface of the outer bark. This membrane is sometimes perfectly transparent, colourless, or of a very pale greyish tint, we cannot discover any indication of organization, or only light traces of lines of junction of these utricula, forming a net-work scarcely distinct, and generally very transparent.

These light traces also disappear when we prolong the maceration a little longer.

In other cases, this membrane puts on a granular texture very conspicuous, as we perceive in the outer bark of the carnation and of the *Agapanthus*. It may be, that this granulation results from the disjunction of the granules, of which we can suppose that this membrane is formed; it may be, that these granules come before an interposed particular matter between the superficial pellicle and the subjacent cellular layer; the opinion which seems to me most satisfactory is, that all the membranes of the outer bark do not present this granular aspect, as we observe in the lily, garlic, iris, day-lily, cabbage, beet, and the like. In all the cases where I

have found this membrane offer thus a granular aspect, these granules fail in the points which correspond to lines of junction of the utricula of the outer bark, in order that the superficial pellicle, detached from these utricula, may present still an analogous net-work to that produced by their lines of junction, but formed by these lines deprived of the granules, and more transparent, absolutely as if this granulation had been the adherence of these utricula to the superficial membrane.

If the maceration has been prolonged for a considerable time, the utricula are detached of themselves; they are decomposed, or else float more or less altered in the liquid; and the pellicle, in general, does not present any trace of net-work produced by the cells, nor any kind of structure discoverable by a microscope.

All the outer barks which I have thus treated by maceration, have presented me this organization, which I believe to be general; but this pellicle under the outer bark, and of which I have just indicated the existence in all outer barks composed of leaves living in the air, appears to me to exist also in submerged aquatic leaves, which are destitute of the layer of colourless cells, which ordinarily constitute the outer bark.

If we place in water the leaves of *Potamogeton lucens*, after a very long continued maceration (continued for three months in my experiments), we perceived that there was separated from the surface of these leaves a pellicle almost colourless, transparent, not granular, presenting reticulated lines which correspond to those separations of the utricula of the green parenchyma, which are found immediately in contact with this pellicle. In the preparation of *Potamogeton* of which I have spoken, these utricula were full of green matter, more or less altered, being, in many points, still applied against the pellicle, but could easily be deranged or raised by very slight drawing, and we distinctly discern their relation with the superficial net-work.

Mr. Henslow, of Cambridge, has recognized the existence of a similar membrane upon the outer bark of the corolla, of the filaments of the stamens, and of the pistil of the *Digitalis*. It was separated from these subjacent cells by maceration in nitric acid.

I believe, in fine, that this is the same pellicle which covers certain stigmata, as I have indicated in those of *Nymphæa* and *Nyctago*, in my researches upon the generation of these plants.

We find, then, that the existence of this simple pellicle, without appreciable organization, is a general fact; that it covers all the organs, with the exception of the extremities of spongelets, of the root, and for the most part of the stigmata, organs in which the utricula, almost free from deep-seated tissue, come to project upon the external surface. This is, then, a general envelope, a continuance of the whole part, and extends almost over the whole surface of the plant. It is probably owing to this that the outer bark owes, in a great measure, its being so little altered by the action of external agents; for in these macerations, it resisted for a much longer time than the other parts, and often when the leaf was entirely reduced to a sort of unformed and fetid pulp, we find still this pellicle formed at the largest laminæ scarcely altered.

This method of analyzing the outer bark in thus separating the different parts of which it is composed, may be also of some service in elucidating the structure of the stomata; and all the observations I have made upon this subject confirm the existence of a real longish opening in the middle of each of these organs. The superficial pellicle, separated from the cellular layer, presents these apertures perfectly transparent, well limited, and which offer no trace of a granular texture which we observe in the pellicle itself; the membrane will then completely fail in this point.

The two moon-shaped utricula which border the interior of the orifice of the stomata, are separated equally by maceration. We thus, also, isolate the different elements constituting the outer bark, and we can understand that it is formed in the four following ways.

1. Of a simple superficial pellicle, continuing without an appreciable texture, or having a granular appearance, pierced with longish apertures, which correspond with the middle of the stomata.

2. Of a layer or of many layers of utricula, of different forms, following the species which we study, disposed with regularity intimately united among them, and generally filled with a colourless liquid.

3. Of longish utricula, arched in the form of a crescent, united two by two, between the concave sides of which is found a space corresponding to the aperture of the superficial pellicle, and constituting the stomata.

4. In fine, this superficial pellicle exists only and without an opening at the surface of aquatic leaves, in which it covers immediately the green parenchyma.

We find that these observations in a great measure confirm the two opinions which we have generally advanced upon the outer bark; the one considering it as constituted of a simple pellicle; the other admitting that it cannot be formed without a layer of utricula of a special form; at length the ordinary outer bark, on aërial leaves, is composed of a cellular layer and of a simple pellicle, which covers this cellular layer and is closely united with it, a pellicle which exists only on submerged leaves, and which I had at first thought to be destitute of this organ.

MR. CONDUCTOR LOUDON ON THE EDUCATION OF GARDENERS.

BY CHRISTOPHER NORTH, ESQ. OF BUCHANAN LODGE.

Fitte the Second.

WHILE the journeyman gardener is thus making himself acquainted, to the degree that circumstances may permit, "with the whole cycle of human knowledge," the indefatigable book-borrower has not been neglectful of personal accomplishments, which Mr. Loudon classes under the following grand divisions —"Dancing, fencing, boxing, wrestling, the infantry manual exercise, whist, backgammon, and the fiddle." Of these, he considers, "dancing, boxing, and the fiddle, as the most essential objects. In most country places, these and all the other acquirements may be learned from retired valets, old soldiers, or from some of the servants in a great family, *at an easy rate*." They may be paid for in vegetables.

Dancing, and the manual exercise, are particularly useful, Mr. Loudon thinks, as improving the gait of a gardener, "and habituating him to good postures, both in standing and sitting." He looks like an old soldier. We fear that retired valets are seldom good hands at the boxing-gloves, and seldomer with the naked mawlies; and that a yokel in a turn-up at a fair has a better chance of flooring his man, by his own natural way of fighting, whatever that may be, than by the pseudo-science taught him by my Lord's gentleman. In the ring, "a little knowledge is a dangerous thing;" and there is nothing, with the uninitiated into the greater mysteries, like good round hitting, closing, and hugging, with an occasional, and perhaps accidental and unaccountable cross buttock. Let the gardener, say we, eschew fighting altogether; if wantonly attacked, let him use the blackthorn, hitting fearlessly at the head; and if his heart be in the right place, by using that simple recipe, he will down half-a-dozen gypsies. Against the fiddle we have nothing to say—except the Scotch one—and in lieu of it we beg to substitute the bagpipe. We can say little or nothing in favour of cards. We hate the whole pack. Mr. Loudon, however, thinks whist "an essential accomplishment of every man who would find his way in society in England, where conversation is not nearly so well understood as on the Continent, and therefore, less relied on, for passing the time agreeably."

An easy, graceful, and yet manly action is to be attained by the young gardener, as we have seen, by the practice of dancing and the manual exercise; but these are insufficient to give him a good address. He is therefore "to read Lord Chesterfield, guarding against those slips of the pen where he seems to recommend impurity and deception." And he can only acquire "a gracious and polite manner of speaking by much reading, and by attending to the language of ladies and gentlemen, frequenters of polished society." Much depends upon the proper management of the muscles of the face. A gardener must not be a gawky. Now our physiognomist has noticed, "that the features of the face may be *set*" to any emotion, so that "if the muscles of the face are put in training by a gardener at the commencement of his apprenticeship, almost any thing may be done with them, as in the case of comedians." Should he tire of his profession, he may go upon the stage, and a Matthews, a Yates, or a John Reeve, be found in every provincial theatre. Yet we find "that a gardener's object should be less the power of varying them than of giving a set expression of animation, joined to a degree of satisfaction; this medium or central disposition he can occasionally alter to that of pleasure on the one hand, or disapprobation on the other, as circumstances require." The art of conversation, so flourishing on the Continent, being little understood here, "consisting, in ordinary society, in tiresome relations as to the party or their affairs, attempts to obtain victory in argument, &c." Mr. Loudon has devised a scheme for the cultivation of conversation, as a delightful art, which we hope will not be confined to gardeners, but extended to all mankind. "Three or four gardeners, all eager for improvement, might practise conversation on this principle, by assembling occasionally, and either conversing as equals, or, for the sake of variety, assuming characters. Two, for example, may take the part of the parents of a family, one or two as strangers on a visit to them, and the rest as children, and so on. The party might first produce that sort of family wrangling and snarling, which commonly occurs at firesides, as the conversation to be avoided; and next a conversation as it ought to be, or as each gardener would desire to have it in his own family." In short, all having already put the muscles of their face in training, and being excellent comedians, they are to have private theatricals, at one another's houses, at which will be enacted extemporary domestic dramas, such as the Spoiled Child, the Brawling Brothers, the Scolding Wife, Who's Papa, and My Uncle. There are few stronger innate principles in human nature than "a pawpensity for the dwama;" and we have only to hope that no beak will interfere with so moral and intellectual an entertainment, no money, we presume, being taken at the door, and the most delicate female parts being performed by stout young gardeners.

There are, Mr. Loudon tells us, two things in conduct which the gardener ought most particularly to avoid—familiarity and cupidity. Nothing more odious than familiarity, nor a more certain mark, he says, of low birth and breeding. Really, as to low birth, there is no need to sneer at it here, for few gardeners are what is called gentlemen born—though many of them are, in the best sense of the word, gentlemen. Low birth and low breeding generally go together, such is the lot of man. And we must not be offended by the familiarity of the vulgar, but make allowances for the manners of well-meaning people, whom Providence has made delvers and ditchers. "A low ignorant man," quoth Mr. Loudon, "if he receive the slightest civilities from a superior, immediately conceives the latter has a particular friendship for him, and even endeavours to turn this friendship to advantage, by asking to borrow money to forward himself in business, or requesting a place under government, or a pension." And pray, why not try to borrow money as well as books? A place under government is a more serious affair, but as for a pension, if the man be an old soldier or sailor, and have a wooden leg, he enjoys one already; and if he be sound, wind and limb, he is probably on the parish. You may, in most cases, put him off with half-a-crown; but it is not so easy to get rid of the fair sex. For Mr. London assures us, that "if a gentleman, or indeed any man, notices a low familiar woman, the latter immediately concludes he is in love with her." Very likely, if the notice taken of her chance to be in a wood, and consist in chucking her under the chin. But then the familiarity is first committed by the gentleman, or any other man, and he must abide the result. On the high-road, or in the harvest-field, or in the churchyard, "on the skaleing o' the kirk," or at the cottage-door, surely you may "notice a low familiar woman," without inspiring her with a sudden belief that you are the victim of passion for her charms, and will never rest till you have effected her ruin, or made her your wife. Few men of our years are more likely to kindle a flame in the susceptible bosom than Christopher North; few men of any years more suave to the sex. Yet we have noticed hundreds, aye, thousands, of maids, wives, and widows, of low birth and low breeding, who dropped us a curtsy, and asked us "to come ben

the house and taste," without seeming, so far as was known to us, simple souls, to suspect us of being over head and ears in love with them, though we confess our crutch has occasionally been spirited away in a most miraculous manner, found next morning by "the auld wife ayont the fire," behind a cabinet in the spence, and delivered to us, without explanation, embroidered with a spider's web, and in the web the spider.

"A well informed and polite man," says our sage, "is not familiar with any one." What sayest thou to that doctrine, dear Charles Lamb? Where are gone "all the familiar faces!" The well-informed and polite man, Mr. Loudon tells us, is not familiar with any one, "because he knows that if he were to lay bare every thing respecting himself, he would lessen respect." There is no occasion to lay bare every thing, not even when you bathe in loch or river; but why such fear of lessening respect? We have some friends—three, or perhaps four—whom we love like uterine brothers—but, thank God, we know them too well, and they know us too well, to allow the possibility of mutual respect. For half a century and upwards we have been as familiar as trees composing one clump on the hill-side—or as clouds brought into union by heaven's own breath "frae a' the airts the wind can blaw," and allowed to settle down on a bright blue spot of sky, for an hour of profound and perfect peace! Respect! Away with it to hypocrites or self-deceivers. But ours be the bond and balm of life—the Christian virtue that is born in the freedom of the heart—fearing nothing, suspecting nothing; but, like a bird on the bough, or a flower on the brae, singing and smiling, for its own sweet sake, as if there were neither sin nor sorrow on all this earth—and that is LOVE—the same love that was in the heart of Cain before he came to envy Abel, and while yet he saw, without anger, the smoke of the sacrifice ascending from that rural altar, "and blessed the brother whom ere long he slew!"

But what saith Mr. Loudon on cupidity? That is out of the question with a well-informed and polite man. And why? Because he knows mankind too well to suppose they will give him a valuable thing merely because he asks it; but even if there were a chance of getting it in this way, still he would not ask, because he might be asked something more valuable in return." Hobbism is heard in all its hardness but from the jaws of a thorough-going Scotsman. No Englishman of the selfish school could have made such a barefaced avowal as this of the principle of his moral creed. His own pride would have been offended by such a direct and explicit confession of his own meanness; and were the words set down for him, we can fancy we see John Bull trampling upon and tossing them, with fire-eyed disdain, like his namesake, more wrathful than seems reasonable with the toggery of a tailor, who is taking a swim with his friends the frogs.

Mr. Loudon, however, makes some amends for his enunciation of such despicable doctrine, by a good remark and pleasing illustration on the subject of "judicious restraint." "A man properly under its influence," he finely says, "may be compared to a well-trained tree; and as this figure is familiar to the young gardener, it may be well for him frequently to ask himself, whether, supposing he were a cherry-tree, he would be reckoned one finely spread against a wall, or an unpruned standard." Fairest and gentlest of readers, that ever dropped a tear on page of Maga, or illumined it with a smile, what sayest thou? Wouldst thou, supposing thy sweet self to be a cherry-tree, be one finely spread against a wall, or an unpruned standard? Oh! not for all the suns and systems in the universe would we see thee finely spread against a wall! Thy tender trunk trained up from childhood in the way it should go, and from which no liberty is left it to depart when it is old—thy delicate limbs, spread eaglewise, fastened with rusty nails and bits of musty flannel to the unfeeling bricks! All the rounded proportions of thy naturally graceful figure flattened into a pancake—or say, rather, a fan, unfolded for ever, yet flirted not at all! What, though by this process thou art made to bear show-cherries like plums? Alas! alas! love sickens and dies at sight of the long, lank, productive espalier! But love springs again to life at the airy whisper of that exquisite unpruned standard, blushing yonder with blossoms that look as if they were composed of snow and fire, blended in wondrous union by the creative and reconciling spring. We clasp her stem that softens in our embrace, and thrills to our passion, while from each core expires a long-drawn mutual sigh. We release her—oh! sweet Helen tree—from our imaginary marriage, and retiring a few steps, that she may have room to display herself all abroad, on the green-sward of the sunny glade, an island in the wood, we gaze on the virgin glory till our soul assimilates itself to the sight, that fills it through a thousand eyes—and oh! metamorphosis divine, transfigured are we into a stately young male cherry-tree, while all the birds of the morning break out into a nuptial song, and so closely intertwined are now our branches, that the sun himself knows not how to distinguish our blossoms, and is pleased to see the loving confusion every moment coloured brighter and brighter with beauty born of bliss; nor can the clouds themselves, who come floating along from the orient to adore and worship, either abate or bedim the still unsubdued splendour of that one-in-two and two-in-one unpruned standard Cherry-Tree.

Supposing a young gardener to have obtained a tolerably good situation at home, and to have proved it for a year or two, Mr. Loudon says he should set about two things; "the first is saving money, and the second is entering into the marriage state." He treats us with two tables of calculations, showing how an industrious, successful, and money-loving gardener may, at fifty, purchase no trifling annuity for two lives—his own and his wife's—and thereby continue to jog on comfortably to the end. We have nothing to object to these tables, except that they leave us rather in the dark as to Mr. Loudon's opinions on marriage. He is manifestly a Malthusian, and speaks with fear and trembling, as well he may, of what he calls "thoughtless and unmeasured procreation." But here is the concluding paragraph of his treatise on the education of gardeners:—

"The vulgar reason why a young man ought to save money is, that he may get together as much as may enable him to collect some furniture and get *married*. This, however, may be called saving to produce want and misery. A young couple, eager to get the use of each other's persons, will not be very nice in the quantity or quality of their furniture. All they consider necessary is, accordingly, often got before either are twenty. Housekeeping and propagation are commenced; and thus the foundation laid of a life of hard labour, scanty food, and their attendants, bad temper, and often disease. After twenty-five years of bustle and distraction, nine or ten children have been produced, and are most probably growing up in rags and ignorance; and all that this couple can say is, that they have struggled hard to create nine times as much misery as that by which they are oppressed. If the man had limited himself for twenty-five years to making the heads of pins, he might have accumulated as much as would have made him independent and comfortable, and still had sufficient time before him to marry, and enjoy the comfort and solace of a wife and children. But the use of a wife to a gardener, and to every man who is not independent, ought to be chiefly as the operative partner in his domestic economy; to prepare his food, and keep in order his lodging and clothes. If, in addition to these duties, she has cultivated, or will cultivate her mind, so as to become interesting as a companion, so much the better; and if the parties further think that they can attain their object of independence, and rear one or two children, let them do so. Universal sources of happiness should never be rejected when they can be retained."

Mr. Loudon seems to us to have here huddled together all the most loathsome language of the anti-propagationists—and,

therefore, he must strip and submit his back to the knout. He speaks like a vulgar fellow, when he speaks "of a young couple eager to get the use of each other's persons." Were that all they were eager about, they would not "wait to collect some furniture." But even if it were, let not this elderly man, by such coarse and hateful words, show himself no better than a monk. He should remember, that in the young, even animal passion itself is commonly accompanied with feelings and fancies that are not animal—and that the most ignorant, coarse, and clownish lout of a clod-hopper, notwithstanding all his grinning, may be seriously in love with a sweetheart whom it is hardly possible for us to look at without laughter, presenting, as she does, so rare an assemblage of all that is most ludicrous in nature and in art. Yet the poor creatures are Christians—they have been married this very day in a church—and, after a supper provided for a few friends, of beans and bacon, and a gallon or two of cider, they will go to bed—now husband and wife—and rising thankfully, long before Mr. Loudon, go together to their work. They contrive to continue in the same cottage, and have children, some of whom die, and are buried with some expense and some grief—others live, sometimes behaving well, and sometimes very ill indeed—and there is scolding, squalling, cuffing, kicking, and frequent pulling of ears. Yet, on the whole, the family are happy—as happiness goes in this world. And 'tis amusing to see how the parents have transmitted both their faces to their eldest daughter Dorothy, who is, notwithstanding, not only a good creature, but a Blue. Yes, she is the village poetess—and here is a little poem of hers on the Battle of Agincourt, which she lately sent in a modest letter to Maga.

> How sublime are Honour's deeds,
> Displaying rectitude;
> In point of Glory there it lies,
> Prince Henry's Magnitude.

Is not our slight sketch more true to nature than Mr. Loudon's finished picture? "Housekeeping and propagation are commenced" are ugly words, because spat in an ugly spirit; and the whole world, we feel assured, will be against Mr. Loudon in the preference he gives to the making of the heads of pins, through the long space of twenty-five revolving years, and with us in the preference we give, through the same protracted period, to the making of the heads and tails of children. From his pitiful prating about pins, it would appear that he thinks the proper age for a man marrying is about forty-five. But what young woman would marry such a foggy, if she could have a spruce lad of two or three-and-twenty? Observe, that a man of five-and-forty, who has been married twenty years and upwards, and can shew a comely wife, and a fine grown-up, or growing-up family of sons and daughters, is virtually a young man, and in the prime of life; but a barren bachelor of the same age has almost always such a suspicious look of longevity about him, that he is often accused, we confess unjustly, of being a Nestor aping a Neoptolemus. Mr. Loudon is as obscure an oracle on the proper age of our friend's wife. "If the parties further think that they can attain their object of independence—*and rear one or two children—let them do so.*" Very laconic. They are to rear only one or two children—pray, are they not to beget any more? And if the answer be,—"No—not any more,"—will Mr. Loudon have the goodness to point out—not for our sakes, we have no personal interest in the matter—but for our married brethren of mankind—how they are to prevent it? Better far, to our mind, a life of hard labour, scanty food, and their attendants, bad temper, and often disease, after twenty-five years of bustle and distraction, nine or ten children, growing up in rags and ignorance, and the hardest struggles to create nine times as much misery as that by which the multiplying pair have been oppressed—better far, we say, the sum-total of the misery, with all its formidable items set down by the steel pen of a Loudon, than the inconceivable and unnatural suffering of that pair sternly resolved, at bidding of a Loudon's "let them do so," to confine the amount of their offspring within the dual number—conjugating and declining, after a dismal fashion, the verb and the noun love; so as to draw tears down Pluto's iron cheeks, and awaken universal sympathy for the infatuated sinners, even among the damned.

"The use of a wife to a gardener, and to every man who is not independent," ought to be, quoth this liberal-minded man, "to prepare his food, and keep in order his lodging and clothes." Let him go into the poorest hut and tell the gude wife so, and she will bundle him out, not without a crack on the sconce from the mop-staff, while she will continue twirling the muff thereof with great animation, as she washes the threshold from the dust off his shoes; and then with loud laughter, pursuing his flight, she flings herself back, on the gude man's elbow-chair, and cries to herself—"What a coof!"

The education of a gardener, or any other man, cannot be complete, we should think, without religion; and so thinks Mr. Loudon. We have seen that he counsels gardeners to bring up their weekly studies, during all the twelve hours of the Sabbath day. Are they never to go to church? That is as it may happen—"as their religion may permit." The sage defines religion—"our opinions as to the nature of things"—it being, he says, the same as devotion, devoted to, and in Latin *religio*. In certain periods of the progress of society, he tells us, morality and religion are treated as depending on each other—"the latter is considered as the principal foundation of the former, and man is taught to be sober and honest, not only to escape the punishment awarded by the laws of his country, but to avoid still greater punishment in future. Fear is the motive to obedience in both cases, and while some defend the principle of employing the fear of hell along with that of the law, others argue that the principle of utility is alone a sufficient foundation for morals. Self-interest, and the dread of losing reputation, they say, is a foundation more to be depended on than a joint fear of the law and of hell, because if the party changes his religion, the fear of hell or future punishment may be got rid of, and what remains of earthly fear may not be sufficient in the first instance to restrain from excess."

Our modern Socrates, "without defending either opinion," begs leave to make a few remarks on both. To rude and gross minds, he thinks "that the fear of being hanged and eternally burned is more suitable than the more simple and refined motives of personal advantage and reputation." It seems to us, that to be hanged and eternally burnt, must be a great personal disadvantage to "any gardener, or any other man;" that self-interest is not lost sight of in seeking to avoid them; and that men may desire to have a fair reputation who believe in future punishments.

Our sage thinks, that as society improves, "man begins to have less extravagant notions of his own importance; and from ranking himself among the immortal gods, at last finds himself but an animal among other animals, and a mere man. His extravagant hopes now vanish, and with these his superstitious fears. He finds nothing left but to make the most of life, by the exercise of his faculties in such a way as to keep up a lively consciousness of existence, and a feeling of enjoyment or happiness." This happens, he says, as "society improves;" and we take the liberty of telling him—*that he lies.*

The truth is, that this man is a wretched ignoramus on all subjects on which it behoveth a man humbly to seek light; and we have been graciously told, that whosoever seeketh in a right spirit shall find it. That he is a wretched ignoramus, we shall shew out of his own mouth. "There are a great many different species (of religion) in the world, and those of the more civilized nations, as the European, Indian, Chinese, like plants which have been long in cultivation, are branched out into numerous varieties."

That is, a piece of pompous pedantry, but let it pass. He continues thus:—"It may well be asked, which is the true religion, or that which a man had best adopt?" Why, does not the blockhead know that the Christian religion is the true religion, and that which a man had best adopt? He does not

know it, and therefore we call him again a wretched ignoramus. Will the gardeners of Britain degrade themselves so far as to *borrow* a book blundered out of the blockhead of such a fool as he who spawned the following filth?—"Truth is either absolute or relative. Absolute truth is that which is true in the nature of things, or capable of demonstration; thus, in arithmetic, three and two are equal to five in every part of the world, and have been so, and will be so for ever. Relative truth is that which is believed to be true by any particular person, or among any particular people. Thus, if a man believe that Rome is paved with cinders, to him it is true; and if a whole people believe, with Pythagoras, that the earth is an immense plain, to them that system is as true as the Copernican system is to us. The same thing holds as to religion, and each species or variety is true to those who believe in it. What may be absolutely true in this sentiment, can only be ascertained by finding out what is common to all religions. It would appear that all of them, of which any distinct accounts are obtained, profess two things; first, to give an account of the origin of the world and of man, their history and destinies; and, secondly, to prescribe some form of devotion. The intention of the first is to satisfy curiosity, and of the second to procure the favour of the Author of nature. As no two religions agree in their historical accounts, and as no greater blessings are observed to follow the devotions of one people more than those of another, all that can be said to be universally true in religion is, that it exists, and that it attempts to explain the nature of things, and prescribe homage to the Author of nature. In short, that it is a sort of speculation on the nature of things,—philosophy in a certain stage of its progress. According to this theory, there can be no person without religion;—that is, there can be no person without ideas as to the nature of things; and whatever any person may think or determine in his own mind on these subjects, these thoughts, and the actions which flow from them, constitute his religion; thus, what are called Deists, Atheists, Sceptics, &c., can no more be said to be without religion, than Christians, Mahommedans, or Chinese. It is true, they are not of any particular religion at present avowed by whole nations, but they have just as much religion as whole nations have; that is, they have certain ideas on the subject, and they act in consequence of these ideas." So Mr. Loudon tells the gardeners of Great Britain, that it is all one whether they be atheists or Christians. For saying so we shall not call him fool, for we are told not to give that name to a brother. Yet we are likewise told, that "the fool saith in his heart, there is no God." He so saith in his heart, because his heart is desperately wicked, and hard as a stone. But affliction comes like a great frost, and slits the stone into pieces, and then the wretch knows that there is a God, and a judgment.

Mr. Loudon is, like ourselves, an editor. He has then a catapulta and a battering-ram to bring against us; and, if our wall be weak, he may hope to breach it, to rush in and storm our citadel, and put our garrison to the sword. But we promise, if he be rash enough to face such an encounter, to meet him, not in the breach, but outside the ramparts, and within his own lines, at the head of a victorious sally, and in our hand the Crutch. *In hoc signo vincimus*—and our very name has long been a tower of strength, and a sword of fire—Christopher North.

Gardeners of Great Britain and of Ireland! for we love the Emerald of the Sea—ye will range yourselves, we know, under our banner. How often have our hearts been gladdened by the sight of that Annual Show, moving to music through the streets and squares of high Dunedin, a waving wood of beautiful green branches, fruit laden, and bright, too, with flowers, while underneath, with measured tread, whose firm sound brings from the dust the pleasant sound of peace, marches a long line of thoughtful, but cheerful faces, of figures, such as, if need were, would drive, with levelled bayonets, all invaders into the sea. Sons of Adam, and followers of his trade! we greet you well—one and all of you—at this hour pursuing your work, which is your pastime, on the bosom of the various spring. We are with you on Mayday. Saunders, give us a spade.

"When Adam delved and Eve span,
Who was then the gentleman?"

Why, Adam, to be sure, and Eve was the lady—and so is every Adam still—and so is every Eve—who delving, remembers that he too is but a worm; who spinning, thinks sometimes of her own frail thread of life!

O, gardeners of Mid-Lothian! we saw you—through a window—we say not in what street—with our own old eyes, walking in that multitudinous procession on the day celebrative of —— Reform. What Pan, and Sylvanus, and Vertumnus, and Pomona, and Flora, thought and felt, we know not; perhaps even as Christopher North. May no frost kill the blossoms of your hopes! May the tree then planted be the best of bearers, and a very golden pippin in the flavour of its fruit!

As for you, ye Plumbers, "with leaden eyes that love the ground!" we noticed your banner, emblazoned with "Christopher under the Pump." It was a poor caricature—and the inscription stolen from Maga. It had been well if all the members of your managing committee had confined themselves to such petty theft. But, on the very day before the procession, that very standard-bearer, availing himself of his office of Inspector of the Gutters, in which we had employed and paid him for a good many years, cut off some hundred pound weight of lead, and rolled it up like a few yards of carpeting, over his unseen shoulder with it, down stairs, out of the area-door, and, having deposited it in a place of safety, away to speak on Reform—the orator being at the same time a Thief and a Robber.

NOTES ON FALLOWING.

1st. NATURE does not require any pause or rest, and the earth was evidently designed to yield a regular uninterrupted produce.

2ndly. As the productive quality of the earth never ceases, if corn is not sown, weed will be produced; therefore, it is our business to expel the unproductive plant, and to introduce others that are beneficial.

3rdly. That the idea of leaving land at rest, is ridiculous; for, by keeping it clean, and by a judicious intermixture of crops, it may be managed like a garden, and sown from one generation to another.

4thly. That the fallows in England, exhibits nothing but a conflict betwixt the farmer and his weeds, in which the latter prevail; for at best, they are only half-stifled, and never effectually killed.

It is acknowledged, that it is only upon wet soils, or, in other words, on land unfit for the turnip husbandry, that a plain summer fallow is necessary, and this, we suppose, includes three-fourths of the Island. To speak of following nature in farming is ridiculous; for, if we were to imitate nature, we would not cultivate land at all.

Clay-soils, and every soil incumbent upon a wet bottom, cannot be kept clean without the assistance of this radical and ancient practice.

The process of drilling cannot be executed upon clay-soils, with the slightest prospect of advantage.

BAYSWATER LIBEL ON THE WORKS OF CREATION.

In that miraculous work, the Encyclopædia of Plants, which was got up at the Bayswater Book Manufactory, as a partial specimen of the universal language of hieroglyphics, which the conductor sanguinely prophesies will supersede all others throughout the world, when Egyptian darkness, as he hopes and trusts is to extinguish civilization: we find the following notable attack on a group of plants, though not *created* plants we presume, but only the *caput mortuum* of the blind chemistry by which all animals and plants are alleged in such writings to have been produced, The plants of the genus *Valantia* are certainly not so showy nor so useful to man as many others: but do they merit to be libelled in the following terms?

"*Miserable weeds*, of no beauty, or [nor] use; called by their present name by Linnæus, in reference to Sebastian Vaillant, a learned and excellent French botanist, who died in 1722. The author of the name would have employed his time better in considering the botanical writings of Vaillant, than in identifying with *the most worthless part of vegetation* an author's merits he was not able to understand. No man was more given to sneers of this kind than Linnæus: and yet his followers manifest a most extraordinary degree of sensitiveness whenever he is retorted upon in a similar way, although few ever deserved criticism in some things in a higher degree than himself."—P. 862.

That this balderdash is from the pen of Dr. Professor Lindley, who is employed in Loudon's Book manufactory, as an occasional jobbing hand,—we infer first, from the declaration in the preface, that this Lindley "either wrote or examined the notes," and secondly, from similar contemptible language, being used for other plants in a portion of the same work, expressly said to have been written by this Lindley at page 1083, where we have the *Urticeæ* characterised as "*worthless* weeds and *shabby* half herbaceous shrubs."

What daring presumption! what libelling blasphemy! to say that any portion of the glorious garniture with which the Creator has vested the green earth, is *worthless* and *shabby!* "Vain man," says Solomon, "would be wise, though he were born like a wild ass's colt."

ON VEGETABLE ABSORPTION OF ALIMENT.

BY PROFESSOR TIEDEMANN, OF HEIDELBERG.

All plants take their nourishment by absorption. The liquid alimentary matters are equally absorbed by the organs placed at the exterior of the body among the embryos of animals still enclosed in the egg; but after they have broken the envelope of the egg, the animals receive their aliment by a particular opening, the mouth, of which vegetables are deprived, and they pass through a canal equally particular, in form of a sac,—the intestinal canal,—where the liquid parts are already absorbed by themselves, or become such by the addition of moisture coming from the same body. We intend to treat here of absorption in plants only.

The organs by means of which vegetables plunged and implanted in the aliments themselves, absorbs those matters which serve for their nourishment are well known. The roots of cellular plants, of many mosses, of some lichens and mushrooms, are filiform, prolongations or capillary, at times branchy, which, the same as the entire plant, are composed of a cellular, tissue containing often cavities in form of a sac, in which the absorbed liquid mounts. In the roots of vascular plants, particularly dicotylodonous plants, we can distinguish a body, with its ramifications and appendages. Among the grasses, we perceive a knot where the radical fibres meet. The body of the root is composed of wood and bark. The first, which, among certain plants, incloses the pith, results from an assemblage of cellular tissue and of vessels. Some anatomists, Duhamel (*Physigne des Anbres*), Camparetti, Bell (*Mem. of the Manchester Society, Tab. II. p.* 403), Link, and others say, that they have seen in the woody part, real spiral vessels, of which the existence is denied by others. The bark contains much of cellular tissue, as that of the nutrient vessels necessary to the growth of the roots. Those which are deprived of the outer bark (*epidermis*), properly so called, are as much in the *Monocotyledons* as in the *Dicotyledons*, after the researches of Kieser and of L. C. Treviranus (*Ueber die Oberhaut der Gewaechse: Vermischte Schriften*). The radical fibres are for the most part of a cylindrical form. having their ramifications more delicately furnished with appendages capillary, or spongy, and which Treviranus has found only composed of cellular tissue. Following the experimental facts of Senebier, Caradoni, and Decandolle (*Mem. sur le Developpement des Racines; dans Annal. de Sc. Nat. de Genève* 1826, *p.* 1.) It is principally the extremities of these appendages which accomplish the act of absorption. We still cannot find orifices or

pores by which the liquid nourishment penetrates. If they do exist, they of necessity are infinitely small, since from the experiments of Sprengel and of Link (*Grundlehren, &c., p.* 72), the radical fibres suck up colouring matters minutely divided and dissolved in water without touching the cells of larger molecules. The latter are only absorbed when the roots are injured.

It results from the experiments of Labaisse, (*Diss. sur la Circulation de la Sève dans les Plantes, p.* 33), Hales, Senebier, and others, that absorption by the roots takes place in a manner very active, especially in the spring. Some physiologists have attributed to these organs the faculty of making a choice in those liquid substances with which they come in contact, and to refuse those which were not most necessary for their nutrition. This is an error, which numerous recent experiments have sufficiently refuted. Th. de Saussure has found that plants absorb common salt, nitrate of lime, the sulphate of potass, sal ammoniac, sulphate of copper, sugar, gum arabic, and the like. G. J. Jæger (*Diss. de Effectis Arsenici in varios Organismos. Tubingue.* 1808.) has verified the deleterious action of arsenic upon plants of which the roots plunged in water containing only a small quantity of this substance; these withered and perished. C. J. F. Becker, Schreibers, and Goeppert have seen that hydrocyanic acid produced a similar effect. We are indebted to M. Marcet, junior, for numerous and interesting experiments, and of which the result was, that plants having different mineral substances dissolved in water, as the arsenical acid, corrossive sublimate, salts of copper and of lead, also that of the extracts of opium, belladonna, nux vomica and of hemlock, hydrocyanic acid, alcohol, and the like, and that this absorption exercised a deleterious influence upon them. Similar experiments have been made by Macaire Prinsep, also by Schuebler and Zeller, with the same results.

This absorbing faculty belongs also to the leaves. That which proves that plants absorb liquids by means of their leaves, of advantage to their nutrition, is the benign action which is exercised upon the rose by the rain and the sprinkling of the leaves with water, circumstances which all favour their growth. Many vegetables, of which the roots are reduced almost to nothing, but of which the leaves are thick and succulent, for example the *Cactus*, preserves itself principally by absorption, which accomplishes these, and which preserves itself even fresh, after having been for some time detached from the plant. Many cellular plants, sea-weeds, *Conferveæ*, mushrooms, lichens, and mosses especially, absorb abundantly liquids by their entire surface, and some even, as the greater part of the lichens, which may be properly said to be destitute of roots, appear to nourish themselves by absorption performed at the surface. Hales proved by experiments, that vegetables increase in weight in a moist atmosphere. Mariotte Duhamel, Merret, and especially Bonnet, have equally put out of doubt the absorption exercised by the leaves. The latter has remarked that leaves draw from water not only that which preserves themselves, but also tends to keep alive the branches and branchlets which support them. Absorption of liquids appears to take place on both surfaces of the leaves in herbs, and chiefly by the lower surface in trees and shrubs. It is probably their longish pores which carry on absorption, as is admitted by Humboldt, Kroker, Sprengel (*Biologie, Tab. IV, p.* 38), Schrank, G. R. Treviranus, and L. C. Treviranus. Among cellular plants, however, which have not any pores, it takes place without this.

A problem is here presented to be resolved, namely, if the introduction of liquid alimentary matter into the interior of plants is a pure result of capillary action of a porous body, such as occurs when a glass tube of very narrow calibre draws up the liquid in which it is plunged; or if absorption be rather a peculiar vital phenomenon. Many physiologists, Malpighi, Grew, Bonelli, Delahire, Bradley, and others, have admitted the first hypothesis, and considered the rootlets as so many capillary tubes, whose office it is to pump up, and cause to ascend the nourishing liquids. It is possible, that this force in part, contributes to the production of the phenomena; but it cannot be the sole cause, as the following considerations clearly prove. Absorption of nourishing liquid varies according to the state of plants, the periods of their development, and of their growth, and the epochs of the year during the period of the formation and the growth of leaves, absorption and progression of the sap goes on the more rapidly as the leafing is more rapid. Also at the time of flowering and formation of the fruits and grains, the plants are more nourished from the soil. We likewise know that absorption and the progression of absorb liquid depends upon the influence exercised on plants by heat and light; that absorption indeed is more active in the spring than at any other period, that it diminishes in autumn, and is reduced almost to nothing, if it do not altogether cease in winter. All these phenomena cannot be considered as the pure effects of capillary action, this cannot be modified by the seasons, nor by the influence of heat. In fine, there is still this difference between capillary absorption and that of plants, which is that, a capillary tube does not reject by its upper orifice the liquids which it pumps, while the liquid, absorbed by vegetables, flows through the vessels, as we make an incision into them. These are sufficient motives to oblige us to follow the opinion of Senebrier, Saussure, Desfontaines, Decandolle, and others, who regard the absorption of vegetables as an organic or vital phenomena.

DESCRIPTION OF THE PLATES.

GONOLOBUS DIADEMATUS.

Gorgetted Gonolobus.

Pentandria Digynia. Lin.

Gonolobus. Massæ Pollinis læves, 10, transversæ. Cor. subrota. Sem. comosa. Brown in Hort. Kew. ed. 2. 2. 82.
Suffrutices volubiles. Fol. opposita, latiuscula. Umbellæ interpetiolares. Americæ præsertim inter tropicos indigenæ.

An unrecorded species, which we have ranked in the present genus, chiefly from habit or general likeness; for it has not precisely the transverse anthers, which constitute a prominent feature of Gonolobus, as now defined. Mr. Brown, who has so advantageously remodelled the natural order to which this genus belongs, seems inclined to think that the character should be extended to admit the present species, along with some others which he has not had an opportunity of finally determining, rather than that a separate generic group should be founded on them. Besides the expressed difference, however, the anthers vary in form from those of all the described species of Gonolobus, and the staminеous crown, instead of growing distinctly upon the filaments, is grown to the bottom of the faux, while its connection with the filaments can only be traced by attentive dissection.

A twining shrub, 15 feet high or higher: *stem* corky and furrowed at the lower part; *branches* round, with a tawny fur; hairs articulated. *Leaves* distant, membranous, roughishly furred, elliptically oblong, lanceolately acuminate, contractedly cordate at the base, the lobes meeting together, from two to three inches long, and from an inch and a half to two inches broad, nettedly veined underneath: *petioles* thickish, bent two or three times shorter than the blade; *interpetiolar fringe* but slightly distinguished from the general pubescence. *Umbels* in our specimen 3-5-flowered, capitately contracted, with an *involucre* or *ruffle* of lanceolate *leaflets: common peduncle* thick, shorter than the petioles, *pedicles* about the length of the calyx, separated by narrow bractes. *Flowers* greenish yellow, about an inch in diameter. *Calyx* equal to the faux, campanulate, villous, of five ovately lanceolate leaflets. *Corolla* coriaceous, urceo, lately rotate with darker veins, smooth, opaque on the inside, shining without; *limb* flatly extended, five-parted to below the middle, segments rounded: *faux* short, urceolately tubular: *staminеous crown* light purple, grown to the bottom of the faux, of five squarish scutiform contiguous laminæ which ascend without adhesion along the wall of the faux to a little above its orifice, and are repand at the upper margin, with a very faint triple indentation. *Staminеous column* equal to the crown. *Stigma* depressed, whitish.

CROTALARIA RETUSA.

Wedged-leaved East India Crotalaria.

Diadelphia Decandria. Linn.

Leguminosæ. Jussieu.

Crotalaria. Supra vol. 2, fol. 128.

C. retusa, foliis simplicibus oblongis cuneiformibus retusis, racemo terminali. Willd. sp. pl. 3. 976.
Crotalaria retusa. Linn. sp. pl. 2. 1004. Mill. dict. ed. 8. n. 7. Vahl symb. 1. 53. Hort. Kew. 3. 18. ed. 2. 4. 272. Gærtn. sem. 2. 316. t. 148. fig. 2.
Tandale-cotti. Rheede mal. 9. 45. t. 25.

An annual species, native of the East Indies. Cultivated at Chelsea by Miller, in 1731; the seeds were sent him from Holland by Boerhaave.

DIGITALIS LUTEA.

Small yellow Fox-glove.

Didynamia Angiospermia. Linn.

Scrophulariæ. Jussieu.

D. lutea. foliolis calycinis lanceolatis, corollis acutiusculis labio superiore bifido; inferiore intús barbato, foliis glabris. Brown in Hort. Kew. ed. 2. 4. 29.
Digitalis lutea. Linn. sp. pl. 2. 867. Mill. dict. ed. 8. n. 3. Hort. Kew. 2. 345. Jacq. hort. vindob. 2. 47. t. 105. Willd. sp. pl. 3. 285. Baumgarten en. stirp. transylv. 2. 212.
Digitalis parviflora. Allion. pedem. 1. 70. n. 257. Lamarck and Decand. fl. franç. 3. 597; (nec aliorum.)
Digitalis foliis calycinis lanceolatis, galea bifida, floribus immaculatis. Hall. helv. 332.
Digitalis lutea, minore flore. Riv. Monop. t. 105.
Digitalis lutea parva. Lob. ic. 573. f. 2.
Digitalis minor lutea sive pallida. Park. par. 382. 7.

A hardy perennial plant, native of the South of France, Italy, and Transylvania, where it is found on stoney mountainous places, in the shade. Cultivated in this country by Parkinson before 1629. In the *Flore Francaise* above cited, we find the name of *lutea*, by which the species has been generally known from the time of Linnæus till now, not only changed to one which is less pertinent, but to one by which another species of the same genus has been long since universally known.

POLYGONUM FRUTESCENS.

Shrubby Polygonum.

Octandria Trigynia. Linn.

Polygoneæ. Jussieu.

P. frutescens, caule fruticoso, foliis lanceolatis utrinque attenuatis, ochrea lanceolata internodiis breviore, petalis binis exterioribus minoribus reflexis. Willd. sp. pl. 2. 440.
Polygonum frutescens. Linn. sp. pl. 1. 516. Hort. Kew. 2. 29. ed. 2. 2. 416. Gærtn. sem. 2, 182. t. 119. f. 5.
Polygonum fruticosum, floribus pentapetalis, octandris, trigynis, 2 exterois petalis reflexis, ramis in extremo inermibus. Gmel. sib. 3. 60. t. 12. fig. 2.

Atraphaxis inermis foliis planis. Hort. cliff. 138.
Lapathum orientale, frutex humilis, flore pulchro. Tournef. cor. 38. Amm. in comment. petropol. 14, 400. tab. 13.
Lapathum dauricum montanum, fruticans, ramis, laté sparsis. Amm. ruth. 227.

The present is a hardy shrub, and belongs to a species which forms one of a section of the genus that comprises the common Buckwheat. It is a native of Siberia, and, if Tournefort's plant is really the same, of the Levant. Introduced by Monsieur Richard, in 1770; but is not often met with in our collections, where it requires to be cultivated in the same soil and situation as Rhododendrons and Azaleas.

ERICA AUSTRALIS.

Spanish Heath.

Octandria. Monogynia.

Ericeæ. Jussieu.

This plant is in height about two feet, a native of Spain, and flowers generally in April and May. It will always prove a particularly interresting appendage to the peat border, and should never be dispensed with. The hardy heaths form a little tribe of shrubs whose beauties we cannot class with the splendour of the Kalmias, the Azaleas, and the Rhododendrons, but they equally interest us though through a different medium. They introduce themselves to our feelings, by their modesty and humility; and we readily admit the propriety of Dr. Watts's assertion—

"Humility is a plant of lovely growth."

Still the humble growth of some of the tender species of Erica, whose flowers are occasionally very specious, may further remind us of him who is humble only to embellish his grandeur.

The Erica Australis should be planted in sandy peat; or in a mixture of peat and fresh loam; and like most other of the hardy heaths, though they make root but slowly, may be increased by layers.

EPILOBIUM DODONÆI.

Dododæus's Epilobium.

Octandria. Monogynia. Linn.

Onagrariæ. Jussieu.

Epilobium is compounded of three Greek words, epi lobou ion, a violet upon a pod; or, more literally upon-a-pod-a-violet; not that a violet resembles the blossom, but is intended to indicate a beautiful flower. Dodonæi from Dodonæus, an eminent physician and botanist of Friesland, who lived in the sixteenth century, and published several botanical works in Germany, illustrated by wood cuts similar to those of Gerard and Parkinson.

It is the prettiest plant that we know of the tribe, and is never troublesome, by spreading at the root, as are some species of Epilobium. This species a perennial plant, and is a native of Switzerland; it has been noticed, by some writers, as synonymous with Epilobium angustissimum. Ours is a plant with procumbent stems, and otherwise differing from angustissimum. The height is nine inches, and it flowers in July and August.

After it has done blossoming, the whole of the stems may be cut off, or they will continue to grow, and thus, sometimes, lessen the vigour of the roots. It is easily increased by separating the young shoots in the spring, which will succeed, notwithstanding they may be entirely devoid of any fibrous appendage.

LILIUM TIGRINUM.

Tiger-spotted Lily.

Hexandria. Monogynia. Linn.

Lilliageæ. *Jussieu.*

This plant is a native of China, and in height about four feet, it is a perennial, and flowers in July and August, and was introduced into this country in 1804.

We know of very few plants that excited more general interest than did the Tiger Lily on its introduction into this country. Every one admired, and resolved on possessing, this Chinese beauty; and in a very short time, from its facility of propagation, the cottager and nobleman boasted alike of its splendour in their gardens.

TAGETES PATULA.

French Marygold.

Syngenesia. Polygamia Superflua. Linn.

Corymbiferæ. Jussieu.

This plant is a native of Mexico, and flowers in our gardens in August to October, its height is about three feet, and it is an annual, and was cultivated the first time in this country in 1596.

The cultivation of this plant is so generally known, that nothing need be said respecting it; except to warn our readers against a formidable enemy to the young plants. If they be much eaten, a single examination, late at night, with the assistance of a light, will show the depredators to be young earwigs, (Forficula auriculara). Woollen cloth loosely folded; hollow bean stalks; or two small boards, placed upon each other, with one edge of the upper one raised sufficiently to admit their creeping between them, will form useful traps, and the insects may be destroyed every morning.

1. Arum maculatum

2. Arum maculatum

3. Petunia violacea

4. Streptanthera cuprea

5 Ixia capillaris var v

6 Citrus medica

7 Azalea calendulacea

8 Potentilla atrosanguinea picata

9. Potentilla splendens.

10. Polygala alepecuroides

11. Cynodon dactylon.

12. Myosotis palustris.

13. Biscutella hispida

14. Verbena Aubletia

15 Ononis hircina

16. Tulipa suaveolens.

LADIES' BOTANY*.

BY JOHN LINDLEY, PH. D. F. R. S., &c. &c.

In the preface to this work, the author contends that the principles of the artificial system of Linnæus, which were so important and useful at the time when they were first propounded, are now generally admitted to be altogether unsuited to the present state of science, and states that the author of the latest work published in this country upon that system, is obliged to rest his defence for still following it, upon "the facility with which it enables any one, hitherto unpractised in botany, to arrive at the knowledge of the genus and species of a plant." But, he observes, if a system of botany is only a contrivance to help those, who will not master the elements of the science, to determine the name of a plant; and if it is really necessary to have a mental rail-road on which the student in botany may be impelled without any exertion of his own, then he thinks that the analytical tables of the French are much better contrivances than the sexual system; because if well executed they meet every case, and lead with certainty to positive results. He says he has always been at issue with the Linnæan school as to their system accomplishing even the little it pretends; and appeals to his own personal experience of the difficulties of a beginner, who is unassisted by a tutor, to prove that it is totally opposed to such a conclusion. He began with the Linnæan system, which he had been taught to believe little less than an inspired production. He had plenty of works, compiled according to that system, to consult; and asserts that he was fairly driven to seek refuge in the natural system from the difficulties and inconsistencies of Linnæus. He considers that there is a confusion of ideas in what is urged in favour of the Linnæan system, and that its theoretical simplicity is mistaken for practical facility of application. That the principles of this system are clear, and simple, and easy to be remembered, he cannot deny; but are they, he asks, equally easy in their application? When, for example, a specimen of a monopetalous plant has lost its corolla, or when the stamens or pistils are absent, either accidentally or constitutionally, as in Diæcious plants, what Linnæan botanist can classify the subject of inquiry? Or where a genus comprehends species varying in the number of their stamens, as the Polygonum, Salix, Stellaria, and hundreds of others, who is to say which of the species is to determine the classification of the rest? or when that point is settled, how is a student to know what passed in the mind of the botanical systematist? The latter puts a genus into Octandria, because out of ten species, one has constantly, and two occasionally, eight stamens, and he includes in the same class and order all the other species of the genus, although they have five, six, or ten stamens. He supposes a student to meet with one of the last, and wishes to ascertain its name by the Linnæan system, he will look for it in Pentandria, or Hexandria, or Decandria, in none of which classes will he find it. After wasting his time, and exhausting his patience in a vain pursuit, he must abandon the search in utter hopelessness, for there is no other character he can make use of as a check upon the first. At length some one will tell him that his plant is a Polygonum; he turns to his book, wondering how he could have overlooked it, and he finds Polygonum in Octandria, not because it is Octandrous, but because it is so very like other Polygonums that it cannot be separated from them, and they belong, in most cases, to Octandria. This he conceives to be the unavoidable answer; and that it really means, that it is not in consequence of its accordance with the system that the student's Polygonum is to be discovered, but in consequence of its natural relation to other Polygonums; so that it is necessary to understand the natural system to make use of the artificial one. He acknowledges that such inconvenience is guarded against in some books by special contrivances; but those contrivances form no part of the system. But granting, he says, for argument sake, that these and other objections are overstated, and that the Linnæan system does really facilitate the discovery of the class and order to which a plant belongs, he next considers what advance towards the determination of the genus or species, or, in other words, the name of a plant, a student has really made, and in order, he asserts, that every advantage may be given to the friends of the Linnæan system in this discussion, he examines of what use it will be to him in regard to the few hundred plants which grow wild in England. For this purpose he takes the generic characters in Diandria Monogynia, as stated in Dr. Hooker's British Flora, from which he concludes that, to determine to what genus a plant belongs, a great deal of inquiry beyond the discovery that it has two stamens and one style is indispensably necessary. The student must first be acquainted with the meaning of many techninal terms, he must have the plant in different states of growth, he must procure the fruit, must examine the interior of that part, in short must go through a long and careful examination, which is entirely independent of the sexual system. In other and larger classes, such as Pentandria, Hexandria, Tetrandia, &c., the length and difficulty of such an examination is greatly increased. He distinctly asserts that there is no greater difficulty in determining the natural order of plants than in that of making out the genera in the Linnæan system; in fact, he says it is the very same thing, only with a different result; in the one case it leads to the mere discovery of a name, in the other, to the knowledge of a great number of useful and interesting facts, independent of the name. And this he asserts is so strongly felt by all botanists of any experience, that they never think of using the artificial system themselves, they only recommend it to others.

The work is itself written in the form of letters, addressed to a lady on the botanical education of her chil-

* Ladies' Botany, or a Familiar Introduction to the Study of the Natural System of Botany. By John Lindley, Ph. D. F. R. S., &c. &c., Professor of Botany in the University of London. 1 vol. large 8vo., with plates. London: James Ridgway and Sons. 1834.

dren; in the first of which he relates the following fable from a French author, in answer to a supposed question, whether the difficulties which are said to accompany the study of this branch of science cannot by some little contrivance be either entirely removed, or at least very much diminished:—

A lady one day observing some ants travelling across a table, dropped a piece of sugar in the midst of them; but to her astonishment, although these little insects are noted sugar eaters, they all retreated with terror from the spot, nor did they afterwards find sufficient courage to return to examine the object of their dread; on the contrary, they carefully avoided that which would have proved a treasure, had they known its value.—Struck by this circumstance, the lady placed the same piece of sugar on that part of the table near which the ants were in the habit of crossing, and when she saw one of them approaching it, she gently placed her finger in his way, but in such a manner as not to alarm him, whilst it obstructed his passage; the ant paused, looked round him, and then took a new direction, not exactly towards the sugar, but near it; the lady again opposed his passage gently, and at last, by making him take a sort of zigzag direction, tacking, as it were, at every few steps, the ant was unconsciously brought to the sugar without being frightened. Once there, he attentively examined the glittering rock, touched it with his antennæ, broke off a morsel, and hastened away with it to the ant-hill; thence he presently returned at the head of a host of his comrades, by whom the rest of the sugar was carried off. From this anecdote the author infers, that, if young persons are once alarmed at the aspect of a new pursuit, a knowledge of which they are endeavouring to obtain, it is almost impossible to restore their confidence; but that there are few who, if led to it insensibly, will not persevere till they have made themselves masters of the subject.

There is, he thinks, no mistake into which the public is apt to fall greater than the notion that botany is a science of easy acquirement. It is, by far, too complicated in its phenomena, like all other branches of natural history, and too diversified in form to be attainable as a science, without long and attentive study; nevertheless, he thinks that a certain portion of it may be acquired without any extraordinary application, and he hopes that the plan of his work will sufficiently explain in what manner this may be best done. The mode he recommends to be adopted is, to follow the order he has laid down, and to procure for examination the flowers that are named in it, as they are in most cases within the reach of those who live in the country. The specimens should be carefully compared with the descriptions and plates given of them, and when they are all remembered and understood, he thinks that the student will be a botanist; not a very learned one, but acquainted with many of the fundamental facts of the science, and capable of prosecuting his inquiry to any further point, and of studying other and more scientific works with facility and advantage. The plan he lays down to be pursued by those who desire to push their inquiries beyond the information contained in the present work, is to read some introduction to botany (his own of course), in which the modern views of structure and of vital action are well explained; they should then make themselves familiar with the technical terms, which he has carefully avoided in the work before us, but which cannot be dispensed with in works of a more exact and scientific character, and at the same time perfect themselves in a knowledge of the natural orders, by gathering the wild plants which are within their reach, comparing them with one another, and with the characters assigned to them in systematic works. Being thus provided with a considerable amount of fundamental knowledge, they may then apply themselves to the study of the natural system in its great features, when, and not till then, they will be able to appreciate the various modifications of organization that connect one tribe of plants to another, and to understand the infinite wisdom and beautiful simplicity of design which is visible in the vegetable world, the just application of which, through the countless gradations of form, structure, and modes of existence, he considers, should be the constant aim of the botanist to demonstrate.

The most discouraging part of botany to a beginner, he conceives, to consist either in the numerous new and strange names, the meaning of which he has to learn, or in the minuteness of the parts by which plants are distinguished from each other, or in the great multitude of species of which the vegetable kingdom consists; and he confesses that there is something alarming in the mass of preliminary knowledge, which, it would appear, has to be acquired before any perceptible progress can be made. But when the subject is examined more closely, we shall, he observes, find that only a small number of technical terms employed is really necessary in the beginning, that the minute parts are but little consulted in practice, however much they may be in theory, and that the arrangements of botanists are so perfect, that no more difficulty is experienced from the number of species than in any other branch of natural history. There are certain terms, the exact meaning of which cannot be dispensed with, if the science is to be studied to any good purpose; a certain habit of observation must also be acquired, without which the differences between one plant and another cannot be appreciated or remembered; but these may be gained imperceptibly, or without any extraordinary degree of exertion or industry. The student has only to commence at the beginning, and never to take one step till that which preceded it is secured; he may then advance to whatever point he pleases; and this, the author observes, is the whole secret in teaching botany.

ON LAYING DOWN ARABLE LAND INTO GRASS*.

Agricultural seedsmen declare, that they have done more business in this, than in any other year, for a considerable time back. It may be worth while to inquire into the immediate cause of this extra demand for grass seeds: and also to examine what the layers down of land expect to derive from such a measure.

Those who are acquainted with the general state of farming in this country at the present moment, will be at no loss to account for the more than usual demand for grass seeds. In the first place, corn is at a low, by far too low, a price, to encourage the cultivation of it; while the produce from meadow and pasture ground, in other words, from live stock, fetches remunerating prices. Another thing, many farms are deserted by the tenants, and, of course, fallen into the landlord's hands. The latter takes the easiest way of making anything of his tenantless farms, by laying the whole down as a sheep-walk. This also creates an additional demand upon the seedsman, while it lessens the charges of labour, horses, &c. But there is a new idea, and which begins to be extensively entertained respecting old meadow and pasture land. From time immemorial grass land has been particularly valued, and specially protected by specific clauses in leases and agreements between landlords and tenants; because it was supposed that a meadow was good in proportion to its age; and that, if once broken up, could not be renewed or got back to its former state under a long term of years. The validity of this old opinion and belief has been, of late years, attacked and overthrown by several eminent agricultural writers, particularly W. Aiton, Esq., of Hamilton, who has, by practical tests, proved that grass land, after a certain number of years, becomes mossy and worthless, and should then be broken up, to yield three or four crops of corn, and laid down again as soon as it can be got perfectly cleared from root weeds. By this management heavy crops of corn are obtained, and in such extra quantity as fully repays the expense of seeds to re-lay it down again. And such is the facility with which arable land may be changed to pasture, that an excellent and productive sward will be formed in the second year after sowing a proper selection of permanent grasses, in due quantity, either with or without corn. The propriety and practicability of this new expedient in the business of farming has attracted general notice; and to it, together with the circumstances alluded to before, may be ascribed the increased demand for grass seeds at the present time, for the purpose of laying down new meadow and pasture to serve instead of those intended to be ploughed up.

The introduction of this new branch of "convertible" husbandry is attended with the advantages of keeping more live stock, which is the soul of farming; because greater quantities of manure will be made for the arable crops, as well as for the grass land; thus keeping the whole in good heart, and always in condition, either for the production of hay, corn, or pasturage.

The objections against taking meadow and pasture land into the general rotation of cropping a farm are these, viz. they generally lie close round the homestead, forming convenient outlets from the yards and cattle-sheds; corn crops being at some distance, are less liable to injury from poultry and pigs; every field is not supplyed with water, and therefore cannot be appropriated as cattle pasture; and as grass land is so peremptorily protected by existing leases and agreements, no tenant, so bound up, can avail himself of such conversion, however advantageous it might be to him. But all these objections may be met, and in many cases nullified by judicious exertion on the part of the tenant, by temporary fencing, well-digging, &c., and by permissive measures and assistance on the part of the landlord. And surely the present situation of farmers in general should prompt them to every means of improved culture, however differing from the old or customary routine; and induce every landlord to take off all restrictions which cramp the exertions of the tenant, and compel him to take less from the land than, by improved management, it is calculated to produce.

Old productive meadow land, on the banks of rivers, or in low situations, no one would think of disturbing with the plough; but there is much upland pasture which might be made doubly valuable by being put under a course of arable culture for a few years, and then returned to grass again. Many instances of such conversion might be appealed to as proofs, in different parts of the kingdom, and on different descriptions of soil, as executed by the late Mr. George Sinclair, and by the old firm of Messrs. Thomas Gibbs and Co., Agricultural Seedsmen, Half-moon-street, Piccadilly, London. Heretofore, it was supposed, that seven, some say twenty years, were required to establish a good sound turf; now by the attention bestowed on this branch of rural economy, and by employing a mixture of the best perennial grass seeds, a good and sweet bottom may be obtained, as before observed, in two years.

Land that has been long, or for several years, in grass, is found greatly restored, as to fertility, by the accumulation of vegetable and animal substances therein, and in fine condition for the growth of white crops, when properly treated. Some farmers prefer sowing peas on the first furrow, and which usually yield abundantly; others take a crop of some small kind of oats; for if Poland oats be sowed they fall a prey to the wire-worm, often prevalent in old turf. Whichever crop be chosen, the ground is in fine order to be fallowed in the following year, to get rid of many root weeds which had flourished in the turf. If the fallow be got perfectly clean before the first of June, a crop of tankard turnips or mangold wurtzel may be put in, and eaten or drawn off time enough for sowing wheat; but if not got clean enough for this intermediate crop, the fallowing must be continued to the wheat-sowing season, which brings the field into the regular rotation of the farm.

There are two ways of laying down arable land into grass. The first is laying down with a half-cast of barley or oats, which, if the summer be moist, is the most economical; but if the summer prove dry it is not the best plan. The seedlings of many of the best grasses are, on their first appearance, so feeble and attenuated, that

* From the British Farmer's Magazine.

one day's bright sunshine withers them up; and if the thin crop of corn or favouring season does not protect them, they are lost. A more certain way is to lay down after turnips, by giving up the barley crop, stirring the surface, during summer, till it is as fine as possible, by the action of the plough, harrows, and roller, and sowing the grass seeds upon a smooth surface about the 10th of August, and covered in by a bush-harrow; finishing with the roller. At this season the sun's heat is less ardent, the nights are longer, and the plants, unhurt by drought, gain strength enough to resist the frosts of winter. Whether attempted to be laid down with a single cast of corn in the spring, or sowed in the autumn, if blanks appear in the following spring they are again sowed and raked in before rolling down.

The treatment of young seeds, during the first year after sowing, is of consequence. They had better be skimmed over by the scythe, about the end of June, than grazed by cattle, which may poach, or by sheep, which bite too close. After the month of September, the new grass may receive any kind of stock; being then out of danger, either from the teeth or feet of grazing animals, if the state of the weather or nature of the soil will allow. Every following year each individual plant increases in size and strength, till the whole surface is plenished by the roots and side-shoots; from this time the plants become diminutive and cramped, for want of space; the hardier and most worthless kinds extirpate the best; moss springs up and chokes what remains, and then is the time for breaking it up again, to undergo the course of cropping already described, and so strenuously recommended by many of the first agriculturists of the kingdom.

As the nature of soils, as to their tenaciousness or friability, are very different, so the labour required in breaking up old grass for the reception of a crop of corn is more or less easy. If the soil be tough and untractable by the harrows, dibbing beans on the first furrow may be the best management; but if it will harrow well (whether ploughed in the autumn or spring) peas or oats may be sowed either broad-cast or drilled.

The expense of the seeds, however, is, in laying down new grass, a serious matter to the farmer, who is now puzzled to "make both ends meet." That the superior crops of corn from the freshly broken-up ground will more than cover the expense of seeds, may be relied on; but the expense of buying seeds must be incurred, before the remunerating crops are in the barn: because it would be very impolitic to break up old grass before the new was ready, or nearly ready, to take its place. The expense, per acre, of the best selected permanent grass seeds, would amount to not much less than two pounds; and although common mixtures might be had for less, the dearest, in such cases, will be found the best.

ON GREENHOUSE PLANTS*.

BY MR. TOWERS, AUTHOR OF THE DOMESTIC GARDENER'S MANUAL.

I WISH to combine the *dulce* with the *utile*, to lead the reader on through *pleasurable* paths to the attainment of knowledge, and therefore I propose to familiarize, to the utmost, every beautiful object, to speak of it in the most simple terms possible, to describe its habits, native country, and most approved modes of culture; and then, to *close* the account with the botanical remarks which I conceive to be indispensably required, in order to put the reader in possession of those facts which no cultivator of plants ought to be ignorant of. I shall so far retain my original plan, as to follow the order of the Linnæan classes; thus, we shall proceed methodically. I commence, then, with the first class. Without attempting to write a botanical treatise, I must introduce each of the classes with a few initiatory remarks, otherwise, I shall be doing little better than to speak "in an unknown tongue." In the study of botany on the Linnæan system, there is fortunately no deficiency of elementary works. For young beginners, I am not aware that any better work can be found, nor one written in more familiar language, than the *Letters upon Botany* by the late Priscilla Wakefield, to which I may add the *Grammar* and the *Introduction* to Botany, of that renowned botanist, Sir James Edward Smith, the late President of the Linnæan Society. To attain an elementary knowledge of the *Natural* or *Jussieuan System*, now becoming so fashionable, many more difficulties must be encountered.

I shall now proceed to notice those individual plants which it is my intention to select as fit objects for illustrative description.

The system of Linnæus contains twenty-four classes, arranged in two grand divisions; the *first* of which comprises all those plants whose flowers or fructiferous organs are conspicuous and determinable. The *second division* comprises all those plants whose flowers or organs of fruit are inconspicuous, or not clearly to be determined; such are the ferns, mosses, seaweeds, and the fungi, or mushroom tribe. The first fifteen of these classes are founded upon the number of the stamens or male organs of the flower. The remaining eight classes of the first division depend upon the position or arrangement of the fruitful organs. The twenty-fourth class, *Cryptogamia*, contains, as its name implies, all the members of the second division; that is, the plants whose reproductive organs are inconspicuous and perhaps doubtful. I shall not, in this paper, enlarge upon the structure of the *natural* arrangement, which is too complex to admit of any cursory description, but shall merely notice, in passing, the *order* therein, to which every individual that I describe is to be referred, adding a slight mention of its characteristics.

The first class contains many specimens of exceeding beauty; but as they are, for the greater part, natives of tropical or warm climates, they cannot with safety be generally introduced into the greenhouse. The roots of many of the genera abound in aromatic qualities, as in the ginger, turmeric, zedoary, galingale, &c.; others contain mucilage and nutritive matter in abundance. The native or indigenous genera are unattractive.

This class is named MONANDRIA, because it has but one stamen or male organ. It contains two orders, determinable by the number of the styles. The titles of the orders are *Monogynia* and *Digynia*, the former from the Greek word, *monos* one, and *gyne* or *gyne* female; the latter, from *dis* two, and *gyne*.

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* From the Quarterly Journal of Agriculture.

From this class I select but two plants, as subjects suitable to ordinary culture in common greenhouses.

The first plant is the *Common Indian Shot*, or Indian flowering reed, an old and very favourite tenant of the stove; for, coming from India, it had, for a long period, been considered and treated as a very tender stove plant. Experience has, however, determined that it *may*, under propitious circumstances, and in favourable situations, be preserved in the *open ground*, during our ordinary winters, and almost to a certainty, in a good glazed pit, without fire.

There are two varieties of Indian shot, the one with red flowers, and the other with red spotted or striped with yellow; the former, in the opinion of many, is greatly to be preferred. In the catalogues of Loudon's Encyclopædia of Plants and Hortus Britannicus, these two varieties are described as stove plants, growing to the height of two feet, in flower all the year, with red, and red and yellow flowers; received from India in 1750, propagated by division of the roots, and growing in rich mould. Upon these data, compared with my own experience, I shall give the following directions for the treatment of these elegant plants:—

It is scarcely possible to describe this plant (the flowers of which are of very peculiar structure), so as to make the reader, who has not seen it, understand its general appearance. The roots are of a fleshy texture, somewhat resembling those of the common blue iris, but less bulky. In young seedling plants, the tuberous knobby processes of these roots send up but one stalk, if that may be called such, whose substance is little more than a leaf coiled into a tube, and enclosing another leaf, which protrudes from it in an opposite direction. One leaf proceeds from and within another, as the plant advances in growth, and these expand right and left. They are of a lively and most beautiful green, spear-shaped, smooth, and six or eight inches long. The veins are numerous, proceeding from a central mid-rib, in parallel wavy lines, not forming a network. The stem consists of little more than the footstalks of the leaves, each wrapping round the base of the leaf immediately above it, for the length of two or three inches, varying according to the nature or strength of the plant. When five or six are developed, the flower-stem protrudes from the centre of the upper leaf. The flowers are enclosed in a sheath, and expand in succession, to the number of perhaps from three to five or six. They are ornamental, but fugacious, are divided into six segments, irregular in figure, and of a bright-scarlet, or scarlet and yellow, spotted also or veined with red. The blossom is succeeded by a roundish seed-vessel, supported upon a footstalk; the external covering of the seed-vessel is rough, and rather prickly; this rough coating, as the seeds become mature, detaches itself, or may be readily rubbed off from the inner coat, which remains entire, and contains several globular seeds, somewhat resembling sweet peas, but larger, more polished, and of exceedingly hard texture, insomuch that it is said the natives of the countries where the plant is indigenous use them as shot, whence the familiar name.

It is usual to raise the plants in the spring, by sowing the seeds in a pot, placed in a frame, over a gentle hot-bed. When the young plants have produced two or three leaves, they may be cautiously lifted by a smooth stick, with some of the mould adhering to the fibrous roots, and transferred into separate pots. These pots may either be large sixties, the internal diameter being about three inches, and the depth four inches; and, in this case, when each plant shall have filled the pots with roots, it is to be removed, with its ball entire, into a pot of double the size; or, the larger pots may be used in the first instance, to spare trouble. If the plants have been raised in a hot-bed, they should, after potting off, be replaced in the frame for a few days, and gently watered now and then with milk-warm water, till the roots have fully established themselves. The seeds will certainly vegetate most freely in heat; but they *will* succeed, as I have witnessed, in a parlour window, where the plant also will grow freely, and bring its fruit to perfection.

As the summer advances, so many plants as are not wanted for the greenhouse or sitting-room may be placed in the open borders, where also they will flower freely, and produce ripe seeds.

Many offsets from the roots are sent up; and these may be taken off, and the plants thus multiplied. The *soil* should be a rich mellow loam, made light with road-grit and decayed vegetable earth. When I say *rich* mould, I do not mean *earth*, enriched *by dung*, but *that* fat unctious loam which contains all the staple mineral matters, as siliceous sand, alumen, or pure clay, chalk, and a certain portion of oxide of iron. The soil I made mention of in my first paper, obtained from decayed couch-roots, contains all these matters in excellent proportions. It is a remarkable fact, but not less wonderful than true, that decayed vegetables (and manures do the same eventually), furnish in decay all the staple matters of the finest native loams; and *couch-grass*, though it may owe some of its earthy particles to the soil removed with its roots, wastes down to a perfect pale-brown earth, containing every requisite for promoting and sustaining vegetable growth. This soil, with some decayed leaves, with road-sand in nearly equal parts, will be suitable to the plants in every stage of their growth.

Soft pond or river water should be given pretty freely; and some say that each plant, when flowering, ought to be kept in a pan always full of water. Those that have been retained in the house, in pots, may be kept throughout the winter perfectly safe, in a turf glazed pit; but, in that case, little water should be given. In the *greenhouse*, more fluid may be allowed; and in the *stove*, where the temperature is maintained, during the night, to 50 or 55 deg., the plants will flower freely, and should be liberally supplied with water.

Perhaps it is advisable to raise fresh plants from seeds every spring. I have, however, had one in the stove during winter, which has showed flower occasionally from December to the end of February; and I have just removed it from its pot, and parted the roots with a knife. I think that these plants will furnish all I shall require throughout the season.

The botanical characters of Indian reed or shot, are—

Canna Indica. Class 1. Order 1. *Monandria Monogynia* of Linnæus; that is, with one stamen and one style. *Calyx*, or flower-cup, of three leaves. *Corolla*, or flower-proper, of one petal, divided into six segments. *Anther* simple, attached to the edge of the filament, which is flat, and resembles a petal, or segment of the flower. *Seed-vessel*, a round, slightly angular, germen, with a flat style, the upper part of which (*stigma*) is linear and obtuse. The *germen* becomes a roundish capsule, with three cells, containing globular seeds.

In the natural system, *Canna* constitutes the type of the 152nd order, termed *Cannææ*, in the second great class of plants called the *Monacotyledones*, the seeds of which have generally but one cotyledon or seed lobe. The leaves do not usually articulate with the stems, and the veins run in parallel lines, without ramifying into a net-work. Plants of the order *Cannææ* differ from those of their near neighbours of the 151st order, in their roots being devoid of aromatic properties. *Maranta arundinacea*, or Indian arrow-root, is one of the genera of this natural order. For farther and more minute particulars, the reader is referred to Dr. Lindley's "*Principles of Botany*."

The name *Canna* is a latinized Greek word (Κάννα), and signifies *a reed* or cane.

The only plant in this class which remains to be noticed, as likely to prove of any interest, or suitable to greenhouse culture, is—

Lopezia *racemosa*. *Smooth* (branchiog) *Lopezia*. This is a pretty biennial, producing its clusters of red flowers from the angles (*axillæ*) of the leaves. According to the Encyclopædia of Plants, it was (with the other species of the same genus) named in honour of the licentiate Thomas Lopez, a Spanish botanist, who paid particular attention to the natural history of the New World. It was introduced to England in 1792,

and is a native of Mexico. Grows to the height of 18 inches, and flowers from August to October. The plant is figured and described in the *Botanical Magazine* of the late Mr. Curtis, No. 254. The stem of the plant is four-cornered and smooth, the leaves ovate or egg-shaped, and widest at the base. It may be propagated by suckers from the roots, and grown in common garden soil.

The botanical character of the genus *Lopezia* may be thus stated: Class I. Order 1. *Monandria Monogynia. Calyax* of four leaves. *Corolla* of four petals, irregular; *flowers* not contained in a sheath: hence termed naked. *Filaments* 2, one fertile, producing an anther; the other barren, and resembling a petal. *Germen* below the flower *(inferior)*, becoming a capsule with four valves, having four cells, containing many seeds.

In the natural system it is placed in the 76th order, *Onagrariæ*, and is one of the members of the fifth tribe of that order, *Circeæ*. The plants, among other characteristic distinctions, have usually the seed-vessel below the flower *("inferior")*, which consists of a *calyx* of four leaves, a *corolla* of four petals, and a definite number of stamens. Among the plants of this order are the lovely *fuchsias*, many of which will be hereafter described.

The *second* Linnæan class will furnish several very beautiful tenants of the greenhouse. It is named DIANDRIA, from the number (*dis* two) of its stamens; and it contains three orders, *Monogynia*, *Digynia*, and *Trigynia*, having respectively, one, two, and three styles, or *pistilla*.

In the first order, the interesting family of the olive trees *(Olea)* contains several greenhouse species, but most of them are very tall growers, and attain to the inconvenient height of from 10 to 20 or more feet. I therefore select the *fragrant olive (Olea fragrans)*, as the most suitable, and perhaps the most pleasing of the family. Of the various species may be named the following, as desirable greenhouse plants for large collections.

Olea europæa, several varieties. — Common fruit-bearing olive, which produces the eatable fruit that is pickled and sold under the name "Olives."

Olea capensis. Cape of Good Hope Olive, introduced in 1730. The former has been cultivated in England for above 200 years. It is a "native of the south of Europe."

Olea fragrans grows to a height of 3 or 4 feet; produces yellow flowers in July and August, which are very odoriferous. The leaves are lance-shaped, approaching to oval, and are also fragrant. It has been cultivated here for about 63 years, as it was brought from China, its native country, in 1771. It may be considered as a rather tender evergreen, and unless it have the protection of a very good greenhouse, may be more secure in a sitting-room, where there is a fire, than in any common frame or glazed pit. Tender plants, kept in a room, should not stand, during the night, in the window; they ought to be placed on the mantel-shelf or sideboard, where frosty air cannot reach them: in the day-time they might be brought to the light. The soil should be kept free from drought, but not by any means wet, in the dark months. Loam and peat *(heath mould)*, form a suitable compost; and in it the plant may be raised by layers, and perhaps by cuttings, with the assistance of a little silver sand.

The botanical character of the genus OLEA is the following. Class II. Order 1. *Diandria Monogynia*. It has two stamens and one style.—*Calyx*, or flower-cup, with four teeth. *Corolla* of one petal, rather funnel-shaped, in four divisions, and below the germen *(inferior)*. *Fruit* a *drupe*, that is, a sort of berry, with a fleshy or pulpy substance, enclosing a hard nut. The fruit of the plum, apricot, peach, &c., is a *drupe*.

In the natural system, OLEA is the type of the order No. 124. *Oleinæ*, derived from the Greek words Ελαα or Ελαια *(Elaa, Elaia)* the *olive-tree;* hence *Olea*, and *Oleum* oil (of the olive). The order includes, among other shrubs less known, the *Privets, lilacs, phillyreos;* the flowers are monopetalous, with two stamens; and the seed-vessels have two cells; the leaves are simple, and opposite to one another. Some of the genera comprise evergreens; others deciduous plants.

The JASMINE. This is a beautiful family; there are about ten species which are considered greenhouse plants, and most of these may be raised by cuttings, placed in fine white sand; and, when rooted, transferred to pots singly, containing good rich and open loam; or a compost of loam, peat-earth or sand, and a small portion of perfectly reduced leaves or cow-dung.

The species, out of which a selection may be made, according to the capacity of the house, &c., are the following, those marked thus *, being superior either for beauty or fragrance.

Jasmine, glaucous or sea-green, from the Cape in 1774.
————slender, from Norfolk Island in 1791.
————cape, from Cape of Good Hope in 1816.
————twisted, do. in 1818.
* ————great flowered, from East Indies in 1629.
* ————sweet scented, from Madeira in 1656.

The above produce white flowers; the last named is a climber, attaining twelve or more feet in height.

* ————azorean, from Madeira in 1724.
* ————revolute flowered, from East Indies in 1812.

The last is also a tall grower; both have yellow flowers.

The botanical characters of the genus are,—

JASMINUM. Class II. Order 1. *Diandria Monogynia*. Two stamens; one style. *Flowers* complete, comprising a calyx and corolla. *Calyx* of one leaf, but divided into five segments. *Corolla* inferior, of one petal, cut into five or more segments, tubulous below, limb or border spreading, but bent back *(revoluti)* in one or two species. *Germen* roundish, which becomes a berry with two cells, containing as many seeds.

In the natural system. The Jasmine is referred to *Jasmineæ;* an order which contains but two genera, *Jasminum* and *Nyctanthes*. These are not far removed from the plants of the order *Oleinæ*, to which they were once united. It has been remarked, that the olives will succeed by grafting upon each other, but not upon the jasmines; but surely this difference is not alone to be decisive, for many plants which evince the nearest relationship will not unite by the graft. The manifest distinction between the entire system of *foliage* of the olives and jasmines would offer, I conceive, legitimate cause for the separation of the families.

SCHIZANTHUS. The *blunt-petalled*. A most beautiful species of recent introduction, figured in the Botanical Register, coloured. I extract the following brief notice of the plant from the Botanical Register. "*Schizanthus retusus.*—Blunt-petalled Schizanthus. A splendid annual. Flowers of a rich rose colour, blended with yellow. Native of the Andes of Mendosa, from whence specimens were received from Dr. Gillies. *Culture:* We are ignorant whether it is capable of bearing our summers so well as *S. pinnatus;* hitherto it has been cultivated in the greenhouse, where it flowers for four months successively. It is easily increased by cuttings." I may add, that there appears to be considerable difficulty in rearing this fine species. I possessed but one plant, and wishing to increase it, took off the point of the shoot at the base of one of the leaves, in October. The young plant would not strike, and the parent sickened from the wound, and damped off during the winter. I lately saw a considerable collection at a celebrated nursery, and observed that the young plants were put in pots about three or four inches wide, containing a soil closely resembling black sandy heath mould. The nurseryman assured me that he could raise the plants easily, but found a difficulty of preserving them, just at the period when they showed blossom. Then, a plant would become sickly, mouldy, and die off without remedy: no cause could be assigned, nor conjectured.

There are five or six, perhaps more, species of this family, namely,

S. pinnatus, wing-leaved Schizanthus, hardy.
porrigens, spreading stalked ——— do.
Hookeri, Hooker's *(chile)* ———
Grahami, Graham's *(do.)* ———

The two last and the subject of this article were introduced in 1828, and it may be considered but semi-hardy; at least, they appear to suffer from moisture. The term *Schizanthus* is derived from two Greek words which indicate a *flower*, deeply *cut* and much *divided*, and such are all the members of the family.

Schizanthus belongs to *Diandria Monogynia*, it has two stamina, *effective;* and the rudiments of two others, *sterile*. The *flower* is inferior. The *calyx* five-parted. *Corolla* of two lips, inverted, the upper segment (varying from the usual position) being in this instance the lower one. So situated, a flower is termed *resupinate*. A *leaf* resupinate, has its *faces reversed* by a twist of the foot-stalk, which brings the lower surface in front: the *Alstrœnomeriæ*, a lovely family, afford striking examples of this position of the *leaves*. The upper lip of Schizanthus is in five parts; the lower one in three, narrow and smaller. *Seed-vessel*, a *capsule* of two cells: *seeds* numerous.

Naturally, this genus ranks in the order *Scrophularinæ*, and in the second section, wherein two only of the stamens have anthers. Most of the subjects are purely herbaceous, though a few are shrubs. In this section are to be found the extensive family of Speedwell (*Veronica*), the beautiful slipper-worts (*Galceolaria*), the hedge-hyssop (*Gratiola*), and several others less known. The order will be again referred to.

Justicea. A family of plants named in honour of J. Justice, a Scotch horticulturist and writer of the last century, and who died about the year 1761 or 1762.

It contains a great number of species, natives chiefly of the East and West Indies; and consequently too tender for greenhouse culture. There is among them, however, one which is a plant of singular interest, and which, though it ranks as a stove plant, may, I think, be safely preserved in the dwelling or greenhouse; it is the "*yellow-tufted*" Justicea, and one of the most curious flowerers that can well be found in any collection. In the Hortus Britannicus, it is stated to be *an under shrub of the stove*, growing two *feet high* with *yellow flowers*, imported from Brazil in 1825. I received this plant from a friend last July; it was scarcely three inches high, but showed bloom. Owing to a long journey, and being merely wrapped up in moss, it had little vigour, and the flower failed. Shortly after, however, fresh roots were formed, and it soon produced a flower-stem that increased and came to perfection. I noticed the following particulars at the time, December 7, 1833; they will afford evidence of the nature and habits of the plant. Its flowers are produced in a close terminal spike, the whole of which is of a pale yellowish, slightly green tint. This, with the tufty form of the spike, gives the name to the species. The spike is formed of a series of spikelets, the one opposite to the other; and the pairs are in alternate order, at a right angle with those above and below. The *leaves* are also in pairs, and in the same cross or rectangular order with themselves, and with the flowers that terminate them. These leaves (in a very small plant which flowered in December last) assumed an appearance of singular interest. As the flower-spike advanced and became well developed from being flat, and extending horizontally, they gradually curled in a direction towards the stem, some of them bending almost spirally downwards.

They are large, very handsome, ovate-cordate, highly glazed; and somewhat resemble the leaves of the hornbeam, with the gloss of the beech. The plant is a ready flowerer; mine was scarcely six inches high; I kept it in the pine-stove, wherein, throughout October and November, the heat during night ranged between 53 deg. and 62 deg. Late in November, I perceived that several unopened flowers fell off; I therefore removed the plant to a sitting room, some blossoms expanded in the course of a day; and exposed as it was to the vicissitudes of temperature, open windows in the morning, confined, close air in the evening, &c., it continued in health and bloom. Thus this *stove* plant appears to be semi-hardy; it is of ready culture, and grows well in a mixture of sandy loam, two parts, old decayed wood earth and leaf mould, each one part.

I must add, that, on the 21st of March, 1834, the spike was still in a very ornamental state. In January all the first formed flowers had developed themselves and fallen off; the plant was then removed to the stove. After a period of rest, the spike began to enlarge itself, and other flowers were formed. The old calyxes and tufts remained perfect in form and colour, and early in the present month a complete succession of blossoms pushed from the spaces between them. The spike is now double its former size; that is, about five inches long, and blossom after blossom has appeared. In a word, taking all things into consideration, though the colour of the flower is not vivid, the plant is a perfect gem, and highly deserving of extended culture.

In the Linnæan system Justicea belongs to *Diandria Monogynia*. The flowers are inferior, monopetalous, and irregular. The *calyx* is five parted, tubulous, equal. *Corolla* ringent or gaping, divided into two nearly equal parts: the upper part or lip arched, often reflexed, (bent upwards and backwards); the lower divided into two or three equal parts, which are more or less reflexed. *Anthers* two-celled; *style* long and protruding. *Capsule* of two sells, elastic, with two seeds fixed by little hooks. One plant styled.

Justicea *flavicoma*, or perhaps more correctly *flavacoma*. *Justicia* with a yellow lock, or yellow tufted, presents all the above essential generic characters, with the *specific* peculiarity of having the divisions of the flower-cup (*calyx*) terminated by very long bristly points.

This genus, or family, forms one of the members of the order *Acanthaceæ*, the 145th of the Hortus Britannicus.

Acanthus is the type of the order, and the term is derived from a Greek word (*akantha*), which signifies a plant or shrub abounding with thorns. A fitter type for a tribe, many of whose members are wholly *thornless*, might surely have been chosen; however, the plants agree generally in the peculiar elasticity of their seed-vessels, and the curiously hooked processes of the seeds. Their stems also are swollen just above the pairs of leaves, and that swelling gives them a characteristic appearance: *cuttings* at these joints strike with facility.

Slipperwort—better known by the classic term *Calceolaria*, a noble family, almost without exception, of recent introduction. There are four or more beautiful undershrubs in the genus, which, though introduced about the year 1822, are familiarly known, and extensively cultivated; there are many others of herbaceous characters which are perennial or biennial, and these sport into varieties and sub-varieties of surpassing beauty: they are, many of them at least, prize plants, and are exhibited by florists and others at exhibitions, and are highly admired.

The three undershrubs which may be considered sufficiently hardy for the parterre, are the

1. *Rugosa*, or Wrinkled-leaved Calceolaria, with yellow flowers, produced in tufts of many pairs abundantly throughout the autumn. The leaves are ovate-lanceolate, very rugose or wrinkled, the under surface stained with a ferruginous brown.

2. *Integrifolia*, not differing materially from the preceding, in the mode and duration of flowering. The leaves lance-shaped, less rough.

3. *Angustifolia*, Narrow-leaved, perhaps merely a variety of the last, having acute nervous leaves, not smooth; also yellow flowers. Others might be mentioned, equally adapted to the greenhouse and the frame during winter, and to the decoration of the garden after midsummer. They are indeed almost hardy plants, for cuttings taken in December last from plants that had stood out for two years have taken root in a cold frame, the cuttings being placed in sand, laid upon a substratum of mould in a pot.

Bicolor, or *diffusa*—Two-coloured Calceolaria, is certainly

more tender; its leaves are roughish ovate, or broader at the base, of a delicate pea-green, and downy. The flowers are pale sulphur-yellow; the lower and larger lip tinged with white. The greenhouse is rather too much exposed for its winter abode, and it flourishes in rich verdure in the vinery; but it will live in a well-covered pit.

The soil for these shrubs may be wood-earth, or the siftings of an old wood pile one-half, heath mould one-quarter, and fine sandy loam one quarter, well blended, and kept in a heap for two or three months. This compost is for pot culture. In the open ground after May, I think that well-rooted plants turned out of pots into any rich, and not cloddy soil, will not fail to thrive.

Of the herbaceous fancy varieties, it would be endless to write; as their *type*, the

Corymbosa, or corymbose tufty-flowered, may suffice for general notice. It is a beautiful plant; its flowers are large and yellow; the *stamens* concealed and sensitive when touched. Its leaves are large, opposite, in pairs, rough, strongly veined; and it throws up a tall branchy flower-stem, the leaves upon which are rather heart-shaped, and their bases nearly meet round the stem. It requires a light soil, almost wholly consisting of the siftings of decayed stalks, and leaves of trees; the rougher parts, to the depth of an inch, being placed as drainage at the bottom of the pot. This species, and hundreds of varieties, may be raised from seeds; though perhaps cross impregnation is very frequently resorted to by the florists, The plant is tender, during winter.

Calceolaria, botanically, is found in *Diandria Monogynia*. Flowers irregular but complete. *Calyx* four-cleft. *Corolla*, ringent or gaping, inflated: the lower lip generally appearing like the fore part of a slipper. *Capsule* of two cells. The plants can be raised from seeds, which frequently ripen here, though they are natives of Chile, Peru, &c.

In the natural system, *Calceolaria* is the first of the section, with *two* stamens, of the order *Scrophularinæ*, an order which comprises many plants with irregular, gaping, and personate flowers—such as foxglove, toadflax, and the like; and with opposite leaves, of herbaceous habits. The few shrubby plants of the order are of fragile texture, and their foliage is injured and broken by the slightest violence; this too is often seen in the shrubby *Calceolaria*.

The SAGE, or more correctly the SALVIA family, is one of great interest; it contains many plants that may suit the greenhouse, but they, almost without exception, appear to the greatest advantage in the flower-garden after midsummer. In colour, the flowers vary from white to pale pink, scarlet, and the most splendid crimson; blue is a very prevailing tint, and this passes through a variety of shades till it is lost in the full and deep purple. The salvias appear to me to be the connecting link between several members of the ringent or labiate families of this second Linnæan class, and others which are to be found in the fourteenth, where all the families have irregular and two-lipped flowers.

The species of the family of Salvia are too numerous to be referred to; I therefore shall select, for greenhouse treatment, those acknowledged beauties.

1. The Splendid, *S. splendens*, a native of Mexico, introduced in 1822—bright scarlet.

2. The Fulgent, *S. fulgens*, also from Mexico, 1829—superb crimson.

3. The Involucrated, *S. involucrata*, from Mexico, 1824—pink.

The culture of these salvias is very easy: it may be effected by cuttings of the young side-shoots, or of the upper extremities of the shoots, *always taken under a joint*, or at the junction with a stem. These cuttings, or even slips, the lower leaves being removed, are to be placed in white sand, over a rich sandy loam, both in a pot or deep pan. They are to be inserted just so deep as to allow the next joint above the cuts to rest upon the surface of the sand; and then to be firmly fixed by pressing the sand about the stems, and giving them a gentle watering. The cuttings may stand very close in the pots, and fifty may be struck at once; the pots, however, ought to have a hand-glass placed over them, and be kept shaded from the full sun. If sand alone be employed, the plants ought to be potted off singly, as soon as they have produced good roots, into small sixty-size pots, of rich mellow loam, (such as *cowch* soil, and *decayed vegetable earth*, blended, and occasionally stirred during six months.) If a stratum of sand an inch deep be placed over good soil in a pot, the roots will be excited by the sand, and then will proceed into the soil and be safe. Sand is not absolutely required, but it is an exciting medium; hence the nurserymen use much of it in propagating plants; and it may always be removed and again employed, provided it be kept separate from the soil. Sandy earth will be sufficient, if pure sand cannot readily be obtained; and a cold frame will afford warmth and protection sufficient for the work after the end of March, when the stock for the borders and patches may be prepared. For the green-house stock, September is a suitable month, and the young plants will be rooted for potting off in the winter. *Salvia splendens* should be kept in a temperature of 50 degrees, to insure a handsome foliage, and the potting should be repeated as the roots fill their pots; the soil also ought to be kept moist. I have now by me seven or eight young plants which were potted off early in the year: they have been in a stove, and now show their fine stalked leaves of the richest deep verdure. These leaves, in a cold greenhouse, are deficient in number, become ragged, yellow, and sickly.

The flowers appear at the extremities of the stems, and are scarlet in every part. In winter it frequently happens that the *Corolla* is not produced; but the scarlet calyx, and the coloured bracteæ or involucra, which partially enclose the flowers, are admirable substitutes for the absent corollas. The graceful bend of the flower spike, the gorgeous colour of the blossom, and the verdure of the broad sub-cordate (rather heart-shaped) pointed leaves, standing in opposite pairs, and each pair crossing the one immediately below it, render this plant one of the choicest of parlour ornaments in the early spring. In the autumn, when turned out of the pots into the parterre, the plant forms a grand object. If the soil be rich and light, in great part composed of vegetable mould, the plant sometimes forms a complete bush, three feet high, extensively branchy, and covered with pendent spikes of flowers from August till the period of frost, a hint of which, however, is usually fatal to it.

Salvia fulgens, and *S. involucrata*, on the contrary, are hardier, and have stood in the open ground all winter under shelter only of a flower pot and a few dry leaves. The mode of propagation described above will apply to these, and to most other species of the family. All may be potted and repotted till the size of the pots becomes inconvenient. The plants may then be transferred into the soil of the garden, to which they will gradually accommodate themselves, and become beautiful in the autumn. *S. fulgens* has its two-lipped calices of a dark purplish green, its corollas of glowing crimson, covered, especially the upper finely arched lip, with gorgeous velvet. The corolla is neither (as far as I have seen) absent nor defective; the spike is erect, and the flowers most abundant, though more loose and scattered than in the splendid salvia. *S. involucrata* is pink, its floral leaves large, enclosing the flowers as in a round compact ball. The spike expands erectly, and developes beautiful reddish-lilac flowers; but these are apt to be defective, or to open imperfectly. Were the flowers as free in expanding as they are *individually* beautiful, this species would be unrivalled. As it is, the palm must be yielded to *fulgens*, which, under every consideration of beauty, hardihood, and certainty of flowering, for several months, is, I think, the best of the whole genus, if not the finest autumnal herbaceous plant that we possess.

Of *blue* species we have

Salvia mexicana, . Mexico, 1824.
—— boosiana or amæna, Blue Peruvian, 1821.
—— indica, . . India, 1731.
—— angustifolia . Narrowleaved, from Mexico, 1806.

Salvia ranks in *Dinandria Monogynia*. Flowers complete, of one petal, irregular, or inferior, or below the fruit, which consists of open or naked seeds, in the base of the calyx—not in a seed-vessel. Calyx, various in figure, in some species inflated, in some with three lobes, or three-toothed; and in others five-toothed: thus it is uncertain, as far as refers to the generic character, but is of great utility in arranging the species under different and distinctive heads.

Corolla, ringent or gaping—the upper lip frequently being bold, arched, and prominent.

Filaments of the stamens attached to the lower lip about midway by a slender process, on which they are fixed, and move as on a centre; from this centre the upper half of each filament projects into and under the arch of the upper lip, and bears one of the two anthers; while the lower half runs down the tube of the flower, becomes somewhat enlarged, and the two spurs or heels are sometimes partially united into one. The whole structure is admirable and distinctive, and evinces an approach to the staminous structure of the lobiate flowers of the 14th class.

Seeds frequently ripen and vegetate.

Salvia is found in the *natural* order *Liabatæ*, and in the 5th tribe *Nepeteæ*. This order is not far removed from *Cehrophularineæ*, and it contains many of the genera of *Diandria*, and all those of the first order of the 14th *Linnæan* class, which have four naked seeds seated at the base of the calyx. More will be said upon the labiate flowers, when the plants of that class shall come under consideration. Several greenhouse plants might be added to the list furnished by *Diandria*; but as this paper has become extended, and the genera already noticed will yield an ample number of subjects to those who are inclined to look over the catalogues published, I shall here close my remarks upon the Second Class.

ON FRUITS AND FRUIT TREES.

BY MR. T. RIVERS, JUN.*

I AM a great lover of fruits, and a persevering cultivator; that is, I spare no pains or application to arrive at correct nomenclature; but surely no one, but a man like Mr. Thompson of the London Horticultural Society, can form any idea of the extreme difficulty of attaining that object. Before the publication of his catalogue it was all confusion. Some ten or fifteen years since, I used to order the same article of two or three respectable London nurserymen, and, if they all proved of similar habits, I hoped I had got the right; but if, as it often happened, they were all different, I almost despaired of getting correctly the plant I wanted. There was no individual blame, for we nurserymen all thought we were right. Thanks to the London Horticultural Society, these times are passed, and we now know what to recommend. Mr. Thompson will, however, find the *Catalogue* even now to require revision and correction in the next edition: his ample notes taken in season, and his fine opportunities for taking them, will allow him to do this in the best possible manner.

It is now some years since an account of my orchard in miniature was published: it is still in being, and annually exacts my admiration. Planted on untrenched ground, the substratum strong clay, and the surface never dug, though kept quite clean with the hoe, the trees make short shoots, which are made still shorter by the knife in July: in consequence, every tree is a dense mass of blossom and fruit in its respective seasons, quite delightful to witness. None of the trees are larger than a full-sized gooseberry bush.

The Flemish and other new Pears.—Every person with a garden of ten square yards, ought to plant an Easter beurré, a Marie Louise, and a Hacon's incomparable pear: if they have a larger garden, let them add gloux morceau, beurré Diel, beurré rance, and passe Colmar. These pear trees are all great bearers of fruit of excellent quality; and they seem to flourish in any soil. Confine their roots in a basin of stones, and you may have a pear orchard in miniature without quince stocks. I have a pyretum, in a row on each side of a walk, of nearly 200 varieties, in which is every sort that I have ever heard of as worth notice: besides this, in different parts of the ground, in detached rows, are upwards of 600 pear trees for bearing fruit, in various stages of growth, from 5 years to 50. Every tree planted by my ancestors (for we have been "located" here nearly a century), of a sort not exactly to my mind, I have had grafted with the new varieties; and the effect is wonderful. I hope soon to be able to send all the valuable sorts to market in as great abundance as we have hitherto done those that are common and comparatively worthless. I have omitted to say that all nurserymen may grow specimens of their pears even in a confined space: every alternate year, let a man look over the trees in winter, and apply to the roots of all those beginning to shoot luxuriantly, a sharp spade with unsparing hand; reduce the shoots a little at the same time, and there will soon be a regular crop of blossom buds.

I have also formed a proof walk of *Apples* of 250 sorts. I do not allow myself to get beyond this number. As the seasons roll on, and defects appear, either in quality or growth, I give some their dismissal, some their introduction, and at last hope to be somewhat near perfection. The spade is applied to the roots of the apple trees in the same manner as to those of the pears, to check luxuriance; they are also planted in untrenched ground, with a solid clayey substratum.

Plums and cherries are not quite so tractable, being rather impatient of amputation, though I do not despair of keeping plums within "rules polite."

An Orchard in Pots. Take some large pots, eights or twelves of the London potteries, some strong yellow loam mixed with one third of good rotten dung in lumps; well drain the pots with large pieces of tiles or broken pots, and in this compost plant selected small dwarfs of Hawthornden, courtpendu plat, Kerry pippin, golden Harvey, Cole's golden drop, Keswick codlin, and scarlet nonpareil apples; Passe Colmar, sickle, Beurré de Capiaumont, Marie Louise, and Easter beurré pears; also two or three dwarf prolific nuts. Let the pots stand in the centre, if a confined garden; and by all means keep on their surface, all summer, lumps of rotten manure. Thus treated, it is astonishing how they will flourish; and, if well supplied with water (if manured water, the better), they will bear plentifully. In very severe winters, a little straw should be put over the pots, to prevent the roots being injured by the extreme frost. This may certainly be called a cockney orchard; but I know that, if it is not profitable, it is very pretty.

Grapes from Layers and from Eyes. I have never been able, after a year or two, to observe any difference in their habits.

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* From the Gardener's Magazine.

A prejudice has sometimes arisen against layers, owing to their being planted with vigorous shoots, and not very vigorous roots; that is, layers but one year in pots. We English nurserymen are apt to sell all our plants too young: in this trading country, every one wants a quick return, even nurserymen!! "Heaven save the mark!!" why, we ought not to have a return, but once in ten yerrs. Grapes ought to be layed in 32-pots the first year; removed from the stool, and put into larger pots the second year; again removed into twelves the third or fourth year, and not sold till they bear fruit; and then the gentleman who plants his vinery in January may have an abundant crop of grapes in September. Again, our trained apples, pears, plums, cherries, peaches, nectarines, and apricots, should be trained two years to form the plants; and then, instead of allowing them to get full of rampant and luxuriant wood, let them be removed *every season*, till all their shoots are fully furnished with blossom buds, and their roots are in a state to give those buds enough nourishment to bear fruit even the first season of removal.

In doing all this, we should, perhaps, like many other great but unremunerated men, live before our times: our trees, that would save a man seven years of his life, would be wanted at the same price as an unprepared tree; for, in writing, A. will offer a trained tree at 5*s*., B. will offer his at 7*s*. 6*d*., and in a note calls his prepared trees in a fruiting state; nevertheless, A. will have the order, because he is cheaper, and B.'s recommendation will be thought the puff professional. This will take place in eight cases out of ten, for in such disproportion are intelligent amateurs of gardening; so that poor B., like all clever fellows that march too fast, will find that his peep *in futuro* will give him but little profit. However, as the plan has not yet been tried to any extent, let us hope, in this advancing age, that prepared fruit trees may, in a short time, be appreciated. I shall most certainly try it; and will, some distant day (life permitting), send you a trained Easter beurré pear, with a blossom bud at every joint, and see you pluck pears in October, from a tree planted the same year.

ON THE COTTON PLANT.*

Cotton is by far the most important product of the plants of the order *Malvaceæ*; it was known in very ancient times; its consumption has increased in proportion to the progress of the arts and civilization. It appears to have been originally known only as a product of India, the country which at the present day is supposed by many incapable of producing any but the inferior kinds. As this is an opinion which appears to me to have been hastily formed from the results of experiments in a few situations, instead of after an investigation into the nature and variety of the soils and climates of the different provinces of this extensive country, it will not be perhaps irrelevant to enter into a few details on the subject.

That cotton was originally introduced from India into Egypt, seems probable from Herodotus not mentioning it among the products of the latter country, which he would hardly have failed doing had it been common or cultivated, as its novel and singular appearance must have struck a traveller from Europe; particularly as in his account of the Indians, he mentions that they possess a kind of plant, which, instead of fruit, produces wool of a finer and better quality than that of sheep: of this the natives make their clothes. In another place, he mentions that the Egyptians, as well as the priesthood, are so regardful of neatness, that they wear only linen clothing, and that always newly washed. Book 2. c. 37; and again at c. 71. "Their habit is made of linen; over this they throw a kind of shawl made of white wool, but in these vests of wool they are forbidden by their religion either to be buried, or to enter any sacred edifice." By some authors it has been suggested that we ought in some places to read *cotton* instead of *linen;* but this seems to be taking for granted, that the former was as common in Egypt in ancient times, as it is at present; and it appears to me, that in other places we ought to read *linen* instead *cotton*, as in the account of the Egyptian mode of embalming, the body is said to be wrapped up in bandages of cotton. That this was not the case, is proved by all the mummies which have been opened and the cloth carefully examined under the microscope, having been found to be swathed only in *linen* cloth; which it is not likely would have been the case, if cotton had been as common an article of clothing in those, as it is in the present day, particularly as some of that used for this purpose appears to have been previously worn, as it is repaired in some places. It is not improbable, however, that cotton fabrics were introduced into Egypt from India even at the earliest historical periods, with cinnamon, cassia, and frankincense. Pliny, writing about 500 years subsequent to the time of Herodotus, mentions, lib. 19, c. 1, that the upper part of Egypt, verging towards Arabia, produces a small shrub, which some call *gossypion*, others *xylon*, and from the latter the cloth made from it. *xylina*, bearing a fruit like a nut, from the interior of which a kind of wool is produced, from which cloths are manufactured inferior to none for whiteness and softness, and therefore much prized by the Egyptian priesthood. Dr. Harris, in his Natural History of the Bible, quotes several authors to show that cottoo was known to the Hebrews, adding that the name *butz*, by which it is distinguished, is not found among the Jews till the time of their royalty, when by commerce they obtained articles of dress from other nations. The author of the *Ruins of Palmyra* has shown that the East-Indian trade by that city into Syria was as ancient as the days of Solomon; and Heeren concludes, that cotton fabrics formed an article of the ancient commerce with India, as Ctesias mentions that the Indians possess an insect, which affords a red colour more brilliant than cinnabar, which they employ in dyeing their stuffs. Theophrastus, lib. 4, c. 9., and Pliny, lib. 12, c. 10, who follows him, mentions that the islands Tylos and Aradus, the modern Bahrein, in the Persian Gulf, produce abundance of cotton, which was manufactured into clothing. Heeren, *Commerce of the Ancients, vol.* ii., *p.* 278, *Fr. ed.*, concludes by saying, "Il est fort probable que les plantations de Tylos furent le resultat du commerce avec l'Inde, veritable patrie du coton."

It has sometimes been considered a subject of doubt, whether cotton was indigenous to America, as well as to Asia; but without sufficient reason, as it is mentioned by very early voyagers, formed the only clothing of the natives of Mexico; and as stated by Humboldt, is one of the plants of which the cultivation among the Aztec tribes was as ancient as that of the *pili (Agave)*, the maize and the *quinoa (Chenopodium)*. If more evidence be required it may be mentioned, that Mr. Brown has in his possession cotton not separated from the seeds, as well as cloth manufactured from it, brought by Mr. Cumming from the Peruvian tombs; and it may be added, that the species now recognised as American, differ in character from all the known Indian species.

In a cultivated state, cotton is now distributed over a very

* From Royle's Illustrations of Indian Botany.

wide expanse of the globe on both sides of the Equator: on the north extending as far as the southern shores of Europe, and on the south to the Cape of Good Hope; in the islands of the Pacific Ocean, it if found both in the Friendly and the Society Islands. Nearly under the Line is is cultivated in the islands of Celebes, Java, Timor, and the Seychelles, as well as in Kutung, where the best is said to be grown, extending northwards up the Malayan Peninsula, along the coast of Tenasserim into the Burhmese territory, and from this westward into Siam and China, whence there is a peculiar species. Cotton is common in every part of India; a wild species was found in Ceylon, and another in Silhet by Dr. Roxburgh. From India the cotton seems to have travelled by the way of the Persian Gulf into Arabia, as well as into Persia, and from thence to Syria and Asia Minor. From Arabia and from the ancient commerce by the Red Sea with India it was probably introduced into Egypt, whence it seems to have spread into the interior of Africa, and to both its western and northern coasts. The islands and shores of the Mediterranean long supplied Europe with all the cotton it required; during the reign of Napoleon, he caused it to be introduced into Corsica, Italy, and the southern parts of France; and Mr. Kirkpatrick cultivated it in Spain, near Malaga. In America, cotton is extensively cultivated in the Spanish, Portuguese, Dutch, and English settlements; one species is peculiar to Peru; others are cultivated in the West-India islands; also in Mexico, and in the southern states, as Georgia and Carolina of the United States of North America.

Knowing the countries through which cotton is already spread, the next interesting subject of inquiry is to ascertain the kind of climate it requires, as well as that of the countries where the best kinds are grown, and, if possible, to determine whether this superiority depends on the excellency of the seed, the goodness of the climate, or care in the culture; and here the general results which have been deduced by the illustrious Humboldt render the most essential assistance. He remarks that *Gossypium barbadense hirsutum*, and *religiosum*, have their favourite climate, from 0 to 34 deg. of latitude, where the annual temperature is from 82 68 deg., but that *G. Herbacium* is successfully cultivated in the temperate zone, where, with a mean summer heat of 75. 73 deg., that of winter is not less than 46. 48 deg. Cotton is, however, cultivated as high as 37 deg. of N. latitude in America; beyond latitude 40 deg. in Europe, and even as far North as 46 deg. near Astrakan.

As the British possessions in India extend from 8 to 31 deg. of N. latitude, the whole are included within the favourite tract of the cotton; and as Mr. J. Prinsep has presented us with an epitome of the meteorological phenomena at five places from 12 to 30 deg., it will be seen that the mean temperature of the year, along the whole extent, is what is required for the cultivation of this plant. By all the observations to which Mr. Prinsep had access, the mean temperature of Madras is found to be 81.96 deg.; of Ava, 78.39 deg.; of Calcutta, 78.13 deg.; of Benares, 77. 81 deg.; and of Saharunpore, 73. 5 deg.: to these may be added that of Nagpore, about 80 deg.; Nusseerabad, 76 deg; Bancoorah, 74. 5 deg.; Delhi, about 75 deg. The mean temperature of the winter months at Saharunpore, the most northern station, is moreover about 55 deg., and though we are without any precise data respecting the nature of the climate of the Tianevelly district, the most southern portion, where, however, the best cotton is at present grown, we may safely assume that in point of temperature, and, I believe, in the course of the seasons, every part of the Indian territories is fitted for the cultivation of cotton.

With respect to elevation, Humbodt mentions that in the æquinotical regioas of America, cotton extends to nearly 9,000 feet above the level of the sea, but in Mexico, in 19 deg. 22 min. of N. latitude, it reaches only to 5,500 feet. In the Himalayas I have seen it above 4,000 feet in the tract between the Ganges and Jumma rivers; Dr. Govan mentions it as extending with the sugar-cane to about 4,200 feet between the Jamna and Sutlej rivers; both situations are within 28 to 31½ deg. of N. latitude; but in neither is it cultivated to any extent, a few plants only are grown about the villages, of which the produce is used by the females of the family. Mr. Trail mentions that the cotton of the Kemaon district is superior to that of the plains in softness of texture, gloss of colour, and length of fibre.

In addition to the information which has been obtained regarding the temperature required for the successful growth of cotton, and the notices we have from cultivators respecting the soil, it is desirable also to ascertain the degree of atmospheric dryness and moisture which is best suited to the formation of cotton-wool. Respecting this I have been unable to obtain any information, but there is no doubt that from the extent of their distribution, the several cultivated species must be subject to very different degrees of evaporation, and the production of cotton, both as regard quantity and quality, must, I conceive, be influenced by this as well as other causes, particularly as we know that the formation of flowers and fruit depends upon the nature and quality of the secretions which are formed by the leaves, and in the cotton, probably, by the leaflets of the involucel or exterior calyx. As the density of these secretions depends as much upon the rate of perspiration as upon the supply of moisture by the roots, it follows that different states of humidity in the atmosphere, checking or exciting perspiration, will influence the retention of the fluids in the state of sap, or their conversion into concentrated secretions; and, as it is upon the latter that depend the formation of flowers and fruit, it follows that whatever favours the former will be useful to the latter; or, as Professor Lindley has well and briefly expressed it, Transplantation, a dry and heated (and it may be added a rarified) atmosphere, a judicious pruning of the extremities of young growing branches, a great decomposition of carbonic acid by full exposure to light, or whatever interrupts the rapid flow of sap, favours its concentration and the diminution of excessive vegetative vigour, assists the formation of flower-buds, and consequently the production of flowers. But a moist or richly-manured soil, high temperature, with great atmospheric humidity, a free and uninterrupted circulation of sap, or a great accumulation of oxygen, in consequence of the imperfect decomposition of carbonic acid, have all a tendency to dilute the sap, promote the excessively rapid growth, the almost exclusive production of leaf-buds, and are therefore unfavourable to the formation of flower-buds. v. *Principles of Horticulture*, p. 85, and p. 54. The same reasoning will apply to the production of fruit and the perfection of seed, as well as cotton, and any other accessaries or secretions.

The degree of moisture and dryness which is best suited to each species, and for the production of its several parts and products varies so much, that what is excessive for one plant, may be just the degree that is requisite for another. What this is, can only be known in general from experiment and observation; and in the present case we only know what some cultivators have stated that, according to the moisture or dryness of a climate, the cotton was long or short stapled, fine or coarse, early or late in flowering, as well as varying in the quantity it bore. There is no doubt considerable differences must exist in this respect between the equability of insular climates within the tropics, the moist climates of Bengal and Guiana, and the moderation in temperature and evaporation of Georgia and Carolina, as well as of the south of Europe.

It is generally admitted that the quality of cotton improves in proportion to its vicinity to the sea; but the Pernambuco cotton is said to be injured by this proximity, and to improve in proportion as its cultivation advances into the interior (*Koster's Brazil*). With regard to latitude, the cotton of Java under the Line is almost the worst in the market, and that from Guiana and Brazil, within a few degrees of the Line, is the second in quality; while that from Jamaica, in 20 deg. of

N. latitude, more costly in production, is 30 per cent. worse than that from Demerara, 14 deg. more to the southward; while the cotton of Georgia and the Carolinas, nearly at the most northern limit of its extension, is the best that is produced; and the cotton of Egypt, of which the cultivation, with returning civilization, has returned to the country by which it was first made known in Europe, is of excellent quality. In India, though some fine cotton is produceed in the neighbourhood of Dacca, and some other places, that of Bengal, according to Mr. Colebrook, is worse than that of the north-western provinces; and the natural vegetation of these, as we have seen in so many instances, corresponds to that of the coast of Coromandel, where the cotton is grown, of which the Madras long-cloths are made. It would appear, therefore, that not only is temperature necessary to be considered, but also the due balance between the supply of moisture to the roots, and its escape by the perspiratory surface of the leaves, as well as all the varied processes of a judicious culture, in addition to the choice of the species or variety to be cultivated in any particular locality.

In the choice, however, of seeds, it does not follow that that which is best suited to one climate, is the kind most eligible for introduction into another, where the requisites of soil and climate may be neither identical nor analogous. Dr. Rohr and Bennet mention, that even in the same field some plants were ten times more productive than others, and that a variety which was sterile in one situation, became fertile when removed to another, which did noe appear more favourable; while a kind that in one hore but little cotton, became most productive in a neighbouring farm. Much, therefore, may be done in improving the kinds which already exist in India, by ascertaining with precision the parts of the country where the best cotton is already produced, the peculiarities of soil, climate, and culture. selecting the most prolific plants, and extending their cultivation, to the exclusion of less fertile and inferior kinds; exchanging the produce of one place with that of another, when others can be induced to take the same trouble in selecting and preserving only the best kind of seed. Doing, in fact, what is every where done by all who are interested in the improved cultivation of grain, vegetables, fruit, or flowers; though some varieties are difficult to propagate by seed, yet others may be continued sufficiently long to attain the permanency of species, instead of the liability to change of varieties.—*To be concluded in our next.*

NEW METHOD OF CULTIVATING THE MUSHROOM.

The author informs us that being a great lover of mushrooms, he was desirous of obtaining them more readily than they were to be had in his native city; and, for this purpose he sought for information on the subject of their culture in books, by observation, by travel, and by conversing with cultivators. He does not seem to have had recourse to any English works; but an Englishman gave him directions how to make spawn. By observation he found that too much humidity and too much dryness alike destroyed the mushroom spawn, whether in pastures or in artificial beds. He found that, if much rain fell in May and June, there were very few mushrooms to be found in the September following. He also found that watering a mushroom bed immediately after it was made destroyed the spawn, as did exposing the bed to the full influence of the light and air. In the course of a tour of Germany he learned what he considers the best mode of producing spawn; which is by the use of short horse dung with a little dry cow-dung; these being mixed together, the mass is peirced with holes, into each of which a little bran of wheat and a pinch of sal ammoniac is put. He concludes his chapter on making spawn by observing that, if the farmers and stable-keepers of Belgium knew how to cultivate mushrooms, they might soon become so abundant throughout the year, as to be within the reach of the poorest citizen. This is an excellent idea, and if acted upon would be not only profitable, but a means of occupying the hours he now spends in the tavern.

Perhaps the only idea in the tract which is new to the English gardener, is that of employing the dried powder of cow-dung as a surface dressing to mushroom beds, and, after it is laid on, watering it with water in which nitre has been dissolved, at the rate of two ounces of nitre to the water intended for four square feet of ground. The use of nitre, the author says, is an invention of his own; and he thinks that it not only produces a more abundant crop, but eight or ten days earlier.

He grows mushrooms in boxes, drawers, and in all the different modes now in use, and he goes even so far as to cultivate them on the shelves or presses, in stables or cow-houses, in cellars, in garrets, in closets under stairs, in old chests of drawers, in bedrooms, and under stages of flowers even in drawing-rooms; in short, wherever he can find room for a drawer or box 7 inches deep.

To preserve mushrooms fresh for a few days after being gathered, he tells us to put them in a flower-pot among dry sand, and set the pot in a cool place. To preserve them for a few months, he orders them to be dried a little, next to coat them with butter, and then immerse them in jelly in a gallipot, covering them with melted suet, and tying a piece of bladder to the mouth of the pot.

ON THE INCREASE OF THE ROOTS AND THE STUMP IN THE SILVER FIR LONG AFTER IT HAS BEEN FELLED.

By M. Dutrochet, Member of the Institute, Paris.

When a tree has been felled, and when no shoots arise from this stump, as well as the roots which fix it in the ground, fail not in a short time to die. The cause of this phenomenon is found in that well-known law of vegetation by which the leaves are produced from the effect of the sap, the latter being essential to the life and growth of the tree, both in the branches and the root. When the stump reproduces stems after the tree has been felled, the roots may continue to flourish to an indefinite period. Thus, in coppice-woods, the roots of the same trees live to an indefinite number of centuries, and their existence may be prolonged to an indeterminate period. It is well known that the coniferous trees never reprodnce stems when the tree has been felled; and that the stump and roots which fix it in the earth usually die, and are quickly decomposed.

There is, however, a very remarkable exception to this fact in the silver fir (*Pinus picea*, Lin., *Abies pectinata*, De Cand.) The stump and roots of this tree continue to live, and even grow, during a great number of years. This singular fact was pointed out to me by my brother, inspector of forests, one of the most intelligent men connected with the forest administration; though I must confess I doubted the fact till I was enabled to verify it myself. I have seen old stumps of the silver fir which according to certain marks, had been felled forty-five year, before, still full of life. The interior was entirely decayed, but the outer wood and the bark presented signs of life. These observations were made in the spring; the stump and the roots being full of sap, the bark, separated from the wood by the effusion of the pulp (*cambium*) was easily detached. This bark and the wood adjacent, had all the appearances which these present when in a flourishing state.

The existence of the pulp *(cambium)* indicated that the stump was increasing in diameter. This point I was also able to prove, which I did in the following manner. I perceived that a kind of enlargement was formed between the bark and the wood of the stump, and that this swelling, consisting of the wood and bark which had been produced since the tree was felled, had again covered a portion of the transversal section of the stump, so that the section of the sap which limited the central system of the tree at the time of its being felled was in perfect preservation. The traces of the axe on this sap, transversely divided, removed all doubts on this point. I have also seen on all these stumps an increase in diameter from the production of new pulp, the thickness of which, in the old branches which I examined, was about two-fifths of an inch, so that these stumps, during the space of forty-five years, had acquired a total increase of four-fifths of an inch, or eight lines in diameter.—The phenomenon which the silver fir presents in such circumstances, appears at first sight to invalidate the theory which supposes the sap furnishing the materials for growth to be derived from the leaves or the umbrageous parts of the vegetable.

But the extreme scantiness of the increase in the diameter of the stump of the silver fir, on the contrary, confirms, this theory which continues to live during so great a number of years, (for the stump, increases thus slowly from the want of leaves, which are peculiarly the productive organs of the nutritive pulp. It appears that the roots of this tree possesses the faculty of producing a small quantity of crude sap, and converting it into nutritive pulp, which preserves life in the roots and stump, and contributes to their scanty growth during a great number of years. This faculty is wanting in the Norway spruce and the Scotch fir, *(Pynus silvestris)*, of which the stumps and roots die soon after the tree has been felled. Whence arises this difference? This is a question not easy decided. However this may be, the fact is very remarkable, which proves that the roots of the trees, and the small portion of the stem which is left when they are felled, do, in certain cases, live a long time and increase, though not surmounted by any foliage.

DESCRIPTION OF THE PLATES.

ARUM MACULATUM.

Polyadelphia. Polyandria. Linn.

Aroideæ. Juss.

Flowers arranged upon a spadix: sometimes separated, but most frequently naked. Stamens in the naked flowers aggregate: in the covered ones opposite to the lobes of the perianth, most frequently equal to them in number. Anthers turned outwards. Ovaries in the separated flowers, aggregate and occupying the lower portion of the spadix; in the perfect ones solitary within the perianth, style more simple. Stigma, Pericarp herried or nut-like. Seeds Albuminose, radical, obtuse, directed towards the hilum, or rarely opposite to. Herbaceous root frequently tuberous or thickened leaves, sheathing simple or compound, all of them radical.

This plant possesses a highly acrid and poisonous juice, dissipated however by heat. Its medical properties are well known, and it is applied to many purposes in our pharmacopiæ.

PETUNIA VIOLACEA.

Pentandria. Monogynia. Linn.

Solaneæ. Juss.

Calyx, shortly tubular, leafy, leaflets laciniated. *Corolla*, tube cylindrical, bellying, limb plaited and divided into five unequal lobes. *Stamina* five unequal, inserted in the middle and within the tube of the corolla. *Ovarium* on a disk having one tooth on each side. *Stigma* capitate. *Capsule* with two valves. Seeds spherical and netted.

Stems prostrate, clammy and hairy; leaves oval, with short footstalks. *Corolla* bellying, lips cut into short divisions.

There are few plants that surpass this in brilliancy of blossoms and general beauty. It is a native of Buenos Ayres, from whence seeds were sent to this country in 1830, by Mr. Tweedie. It succeeds extremely well in the open ground, during summer, but must be treated as a hardy green-house plant in winter: the flowers will show to a great advantage if a whole bed be devoted to them, and where the branches are allowed to spread and become entangled with each other. Under these circumstances the flowers will be produced from July until the end of October, or, at least, as long as the weather will permit. Whether planted in a bed or trained on trellis, it is necessary that the situation be somewhat sheltered from winds, but fully exposed to the influence of the sun.

Cultivated in a green-house, we would recommend it always to be trained to trellis; where it will generally extend from four to six feet square, continuing to flower until quite winter, and commencing again early in spring.

It thrives in almost any sort of soil, but prefers one that is rich and light. It produces seeds by which it may be increased, but also grows very freely from cuttings, which may be taken off at almost any season; its culture is in other respects like those of Geraniums.

STREPTANTHERA CUPREA.

Triandria. Monogynia. Linn.

Irideæ. Juss.

Spatha of two valves, membranaceous, somewhat cut, dry. *Perianthemum* like a corolla in six divisions; tube very short; limbs regularly wheeled. *Stamina* three, inserted in the tube; filaments erect; anthers twisted round and including the style. *Stigmata* three, dilated into two fringed lobes. Seeds round.

Leaves sword-shaped, acute, channelled and cut in the middle. Flower stem bearing from two to four flowers. *Perianthii* cut ovately obtuse; keel having two spots upon the base.

This is a very elegant species, introduced in 1825 by Mr. Synnot, from the Cape of Good Hope. All the Cape Irideæ require one general mode of treatment; which, in general terms, may be stated as follows:—

'Pot the roots, or plant them in a border in front of a stove or green-house, or other sheltered place, during the month of October. Let the soil be composed of equal parts of leaf-mould, sandy loam, and peat, well mixed.

If planted in pots, set them in a cold frame, and protect them from severe weather, till the pots are pretty well filled with their roots; then remove them to the green-house, or room where they are intended to flower.

When potted they must be watered very sparingly, until they have produced leaves and begin to show their flower stems. And after flowering, when the leaves are dead, the roots must be kept perfectly dry in the pots. If planted in a border or frame, they must be completely preserved from rains, snow, or frost, particularly during their dormant state.

They flower generally in April, May, and June, but some species somewhat earlier, others later. The plants at that time require to stand in light airy places, and should receive a good supply of water.

BISCUTELLA HISPIDA.

Hispid Biscutella.

Tetradynamia. Siliculose. LINN.

Cruciferæ. JUSS.

This species of Biscutella was introduced into this country in 1822; it is an annual, two feet in height, and flowers in July and August.

It is not so much under an impression of the beauty, or any other attractive property of this plant, that we are induced to present it to our readers; but rather, as the seeds of several species of Biscutella are now offered amongst new annuals, that they may be made acquainted with the general character of the genus. The greater part of the Biscutellas are hardy annuals, natives of France, Spain, and Italy, where some of them hold the same place in agriculture, as our *Sinapis arvensis* or Charlock, does in Britain, and for which they may readily be mistaken by the common observer.

It is easily propagated by sowing seeds in a light soil, in the spring. Or, if sown in autumn, the young plants will live through the winter and produce earlier flowers.

VERBENA AUBLETIA.

Rose-flowered Vervain.

Didynamia. Angospermia. LINN.

Verbenaceæ. JUSS.

This is a native of North America, and was introduced about 1774: it flowers from July to October, and is in height about fifteen inches; it is a perennial plant.

The Verbena Aubletia is a species which has occupied a place in the English garden more than half a century; but our present variety of it has been lately introduced from America, and to the herbaceous border is a great acquisition.

Many plants which are perennial in their native soil, in more northerly regions can only be cultivated as annuals, unless an artificial climate be afforded them. This is most probably the case with the Verbena Aubletia. With us the seeds should be sown in pots of rich light earth in March, and be forwarded in a hot-bed till the beginning of May, when the plants should be turned out into the borders to flower in autumn.

ONONIS HIRCINA.

Strong-scented Rest-Harrow.

Diadelphia. Decandria. LINN.

Leguminosæ. JUSS.

This plant is a native of Italy, but has been cultivated in this country for a very long period; it is in height about eighteen inches, is a perennial, and flowers in June and July.

Several species of the Rest-harrow, even the wild one of the English banks, the Ononis spinosa, are rendered very ornamental, if kept in poor gravelly soil; but when planted in rich light earth, both the roots and branches, of the latter one in particular, extend themselves unduly, and but few flowers are proportionally yielded.

The stems of this species are herbaceous, and the root is hard and woody. It may be propagated from seeds, sown in the spring; or the roots may be divided.

TULIPA SUAVEOLENS.

Sweet-scented, or Van Tholl Tulip.

Hexandria. Monogynia. LINN.

Liliæ. JUSS.

The Tulip, in some countries, is considered an emblem of perfect love; it is related by Chardin, in his Travels into Persia, that in that country when a lover presents a tulip to the mistress of his affections, he means to inform her, by the general colouring of the flower, that he is on fire with her beauty; and by the black anthers in its centre, that his heart is burnt to a coal.

When planted in the borders, from six to twelve, or more, bulbs may be put in at four inches asunder, so as form an irregularly shaped little bed; for complete circles, ovals, or straight rows, should always be avoided in the mingled parterre. The soil should be well stirred, to the depth of nine inches, and, if stiff, a little sand may be mixed with it. Then take out the soil four inches deep, and having removed the hard brown skin from the bulbs, plant them; fill up with the soil again, and make the whole level. If the situation be damp, or the soil too retentive, a little soil should be placed round the bulb; but if very light, it may be stirred, and the bulbs put in by making holes with a dibble to receive them.

For the earliest flowers, plant from the beginning of September to the end of October; but for later flowers, plant in February. If, in autumn, Van Tholl tulip bulbs be planted singly, in small pots of light rich soil, they will blossom extremely well in the drawing room, and contrast prettily with hyacinths in glasses; but should be frequently exposed to fresh air. They will flower in winter, as hyacinths, but with less certainty, and less luxuriantly.

POLYGALA ALOPECUROIDES.

Fox-tail. Milk-wort.

Diadelphia Octandria. LINN.

Polygalea. JUSS.

Polygala, &c.; floribus imberbibus, pedunculis solitariis, axillaribus, foliis fasiculatis, lanceolatis mucronatis villosis. Thunb. Prod. 121.

Polygala, &c.; floribus imberbibus sessilibus, foliis conpertis ovatis acutis carinatis pilosis. Linn. Mant. 260.

Muraltia Alopecuroides. DE CANDOLLE.

In its Blossoms it is very similar to Polygala Heisteria, but is a smaller shrub, very pubescent, and partakes very little of that inflexible rigidity, which occasioned the former species to be compared to furze. A hardy greenhouse shrub; native of the Cape; propegated by cutting; flowers through the whole of the summer.

IXIA CAPILLARIS AULICA.

Rose-coloured Ixia.

Triandria Monogynia. LINN.

Irideæ. JUSS.

Ixia capillaris, (Aulica Hort. Kew). G.

This is a mere variety of the above species, though made a distinct one in the Hortus Kewensis, under the name of Aulica. The Bulb-tubers of the several varieties differ much in the thickness of the fibres, of which their reticulated coverings are composed, as well as in the size of the Meshes. Our specimen has been very recently imported from the Cape of Good Hope. Their leaves are usually much longer than in our figure, and their cartilaginous edge often very conspicuous, but sometimes again quite obsolete.

CYNODON DACTYLON.

Creeping Dogs-Tooth Grass.

Triandria. Digynia. LINN.

Gramineæ. JUSS.

Spokes four or five, crowded together. Corolla smooth. Panicum Dactylon. Linn. Sp. Pl. 85.

The roots are tough and creeping, almost woody, with smooth

fibres; stems also creeping to a great extent, matted, round, jointed, leafy, very smooth. Leaves tapering, sharp-pointed, ribbed, hairy, and glaucous; with long, striated, smooth sheathed, and a hairy stipula. Flowering branches a span high, leafy, simple, terminating in four or five nearly equal, crowded, erect, many-flowered, linear spikes; the common stalk of each triangular, roughish; flat and slightly bordered on one side, along which the nearly sessile shining, purplish flowers are ranged in two close alternate rows. The corolla is larger than the calyx, very much compressed, opposite, not, as some have thought, alternate, with respect to the latter.

MYOSOTIS PALUSTRIS.

Great Water Scorpion-Grass.

Pentandria. Monogynia. LINN.

Boragineæ. JUSS.

Seeds smooth. Leaves and calyx roughish, with close bristles. Clusters leafless. Calyx funnel-shaped, with short broad spreading teeth. Limb of corolla, horizontal, larger than the tube. Root creeping.

M. Scorpioides Palustus. Linn. Sp. Pl. 188. In clear rivulets and ditches, common Perennial. June, August.

Roots very long, creeping, blackish, with numerous tufts of strong fibres. Herb bright green, rather succulent, from six to twelve or eighteen inches high. Stems ascending obliquely, round, branching, leafy, either nearly smooth, or clothed with more or less spreading, bristly hairs. Leaves sessile, nearly uniform. Clusters many-flowered, two or three together, on a terminal leafless stalk. Partial stalks at first crowded into a dense revolute spike, which unrols gradually. Calyx about half the length of each partial stalk, after the flower is past. Tube of the corollæ about as long as the calyx, whitish. The flower buds are of a fine pink. Style the length of the tube. Stigma capitate, umbilicated. Seeds ovate, compressed, obtuse, blackish, highly polished.

This most elegant plant, the Forget-me-not, among the Germans, is the most distinct and best known example of its genus, though too long confounded with other common species. Linneæs records its being hurtful to sheep, which may have arisen like a similar report of Hydrocolyte vulgaris, from those animals suffering on frequenting the wet situations of these plants.

AZALEA CALENDULACEA.

Pentandria. Monogynia. LINN.

Ericiæ. JUSS.

A native of Carolina and Virginia, on mountains; also of Georgia, where it was found, in 1774, by William Bartram, who in his travels gives this most glowing description of its beauty. "The clusters of the blossoms cover the shrubs in such incredible profusion on the hill sides, that suddenly opening to view from deep shades, I was alarmed by the apprehension of the hill being set on fire." He calls it certainly the most gay and brilliant flowering shrub yet known.

It succeeds very well if planted in a bed of peat, mixed with loam; flowers in May and June, and may be increased by layers, which in two years become sufficiently rooted. It is never injured by the cold of our climate.

POTENTILLA SPLENDENS.

Icosandria. Polygynia. LINN.

Rosaceæ. JUSS.

This is a native of Nepaul, and was introduced in 1824. It is perennial, almost hardy, and will probably become quite naturalized in a little time: the fine silvery leaves are very ornamental: the flowers, which are small, come out in June, and are usually succeeded by seeds, by which, it is readily multiplied. It will grow in almost any soil.

POTENTILLA ATROSANGUINEA-PEDATA.

Hybrid Potentilla.

Icosandria. Polygynia. LINN.

Rosaceæ. JUSS.

This plant is about eighteen inches in height, flowers in June and July, and is perennial. On the introduction of the double compound appellation Atrosanguinea-pedata, we may be expected to offer some remark. Authors have not agreed on the most convenient mode of naming hybrid or mule plants. Some have thought names may be completely arbitrary; some name them after the person with whom they originated; whilst others would altogether excommunicate such productions from botanical nomenclature. Notwithstanding the opposite theoretical position taken by some botanists, we believe, doubtlessly, that hybrid plants sometimes become established, and hold a permanent place in the vegetable kingdom; it is therefore but reasonable to notice them; and it is far better that their origin be registered whilst it is known, in lieu of remaining to become the subject of future conjecture and error. We have taken the trivial names of the two parent species of this hybrid plant, as a compound name for it; and although rather cumbrous, this inconvenience is more than counterbalanced by the advantage that it is explanatory of its hybrid origin. The female parent ought, we think, to hold the first place in the compound name.

We raised this plant from Potentilla atrosanguinea, fertilized with pollen of Potentilla pedata, and we believe a more perfect mixture of two distinct and dissimilar spieces is not known. The dark red of the one, and full yellow of the other, are well mingled, and produce a rich deep orange. The foliage of it also is intermediate between that of its two parents, as shewn by the engraving.

In the year 1833, we fertillized flowers of each of the Potentillas, the atrosanguinea, formosa, and pedata, with pollen of the other two, separately. In each instance their anthers were destroyed before they had burst, the pollen of one of the other species applied to the stigma, and the flower then secured from insects, by a covering of gauze. Out of upwards of two hundred plants thus obtained from Potentilla formosa, not one was sufficiently altered to merit notice. Nearly all those from Potentilla atrosanguinea, were somewhat improved. From Potentilla pedata, we obtained very few seeds. It is not a free seeding species with its own farina, and far less so under a privation of it. The plants from it were remarkably luxuriant, and its blossoms large, but otherwise they showed but little variation.

The novel colour of this new hybrid flower, renders it very desirable. The plant is slender, like that of Potentilla pedata, and in culture may be expected to require no peculiar attention.

CITRUS MEDICA.

Monœcia Polyandria. LINN.

Aurantiaccæ. JUSS.

Calyx campanulate, short 3-5 toothed. Petals, 3-5 broad at the base, distinct or more or less combined, stamens equal in number to the petals, anthers distinct terminal, inserted within the base, erect. Ovary ovate, many-celled; style one rounded stigma somewhat lobed thickish; fruit many-celled, the cells filled with pulp inclosed in little bags, and surrounded by a thickish rind abounding in glands of volatile oil, seeds fixed to the inner angles of the cells generally pendant without albumen sometimes including more than one embryo.

This plant is remarkable for the flagrant bitter essential oil which it contains, and the delicious fruit as well as odorous flowers; it is of very general use in medicine.

ESSAY OF STUDIES ON A HYDROPHYTE OF THE FAMILY OF CERAMIA.

BY MESSRS. CRONAN, BROTHERS, BOTANISTS AT ROUEN AND BREST.

In the numerous investigations which we have made in the vicinity of Brest, to discover rare or durious algæ, we met several times with a species (the *conferva griffithsiana* Engl. Bot. tab. 2312), of which it is still uncertain what place it ought to occupy in modern classifications. Thus, without quoting the first authors who have given the description of this plant, as for at the time they wrote the classification of these vegetables, was not founded on their organization, as it has been for some time past, we will only say that Clement in his essay, and Agardh in his Dispositio universalis algarum, have placed this species with the Algæ not articulated; then afterwards this latter author in his systema algarum made it a Hutchinsia. Bonnemaison (essai sur les Hydrophytes loculées), arranged it in his Boryna with the mark doubtful. M. Duby (botanicum gallicum) places it among his *ceramiam*, between *C. boucheli* and the *C. corymbosum*, and *lamouroux*, after Agardh would have made of the same species a *thyprea*, This diversity of opinions induced us to examine it with peculiar attention, and to endeavour to determine exactly if it were possible, the characters of this production; we were still more urged to do so by M. Gaillon a learned botanist of Boulogne, who says, in his letter to us of the 4th of March, 1833, "this Hydrophyte has not yet been sufficiently studied. It is with uncertaincy that Bonnemaison places it in the genus Boryna, it has the form of a Gaillona, the organization of its stalk places it between this genus, and the Hutchinsia; its branches alone would bring it near the Boryna."

This interestig *Hydrophyte* may be seen from the month of October till May; it thrives on stones and rocks which are only uncovered at spring tides; it grows in tufts of a reddish colour seen in the sea. Its leaf generally a line, or 12th part of an inch in diameter, is round, cartilaginous, without any appearance of partition at the base; it divides into alternate branches, translucid, rambling, long, unequal, of which the articles striæ; seen through a magnifying glass, are rather wider than long. There branches are edged with simple little branches very short, narrow at the extremities, as long as wide at the knots. The fructification visible to the naked eye, consists in capsules dispersed on the branches, and inserted on the articulations. By subjecting afterwards to the microscope, fragments of this algæ we see clearly that its articles are multiplied. The very little branches appear to be simple articles, but this appearance is only owing to the fineness of the striæ or translucid cells which we thought we perceived, (see. pl. 39, fig. 1 and 2.) The specimens that we have been so fortunate as to meet with fructified, seen through a microscope, have presented to us capsules of two sorts. Some are almost visible or pedicellus, two or three lobed, and containing irregular semina, (see pl. 39, fig. 3), of azure blue colour, collected in bundles in the middle of each lobe, and enveloped with mucilage. Bonnemaison had also remarked this particular colour of the semina. The fig. 4, represents the other mode of fructification, where the propagating organs which are limbed have broken the membrane that kept them enclosed. Sowerby has well figured in the English Bot. pl. 2312,) a capsular limbed fructification; but in this specimen the capsules, isolated or united, are dispersed on the branches, and do not issue out, one after the other, joined by a membrane, such as in the form we have given of it. The fig. 5, is the representation of the horizontal cut of the article, or *Endochrome* of Mr. Gaillon, and the fig. 6, that of the articulation or *Endophragmi*. The reading of the learned memoir of Mr. Duby on the difficult family of the *Ceramia*, determined us to examine this hydrophyte still more closely, and to make vertical and horizontal cuts as small as possible, so that we might see its internal organization. After having, with a scalpel, taken of the epidermis, composed of lengthened cells which form the striae, the following cuts have shown us a lining of epidermal texture, resembling a sort of net-work to the cells, like those we have represented, (pl. 39, fig. 7). But what was our satisfaction, when after having made other vertical sections, very small in order to remove this net work, we perceived spherical uncoloured cells, fitting large locules divisions forming the article, which is then simple! These locules that we see very exactly represented, pl. 39, fig. 8, are susceptible of contraction, and produce without doubt, in some species, those coloured lines which have given rise to the belief in the existence of an interior tube; but it cannot be admitted, after having dissected these plants with care, or after having read the memoirs of Messrs. Duby and Gaillon, some observers have brought to believe in the existence of this interior tube. It is not the same illusion which makes us admit these great internal locules full of spherical cells (a character very remarkable); these are microscope cuts which we have executed on the *Endochromes* or articles of this plant, which have confirmed us in the opinion that we had of the double texture composing its leaf. The horizontal cuts have also shown us these spherical uncoloured cells, appearing placed over and filling the ideal axe. We see by the horizontal cut the situation of the cylindrical cells composing the leaf: some of the smaller ones, of an equal diameter, present in this section a circular form: others much larger, present that of an illipsis. Their situation is circular and regular to the middle of the diameter of the leaf, (see pl. 39, fig. 9,) but does not surround a central cell as in the genera *Hutchinsia, Ag*, and *Gaillona Bonnemaison*. Bonnemaison says in his essay, (p. 53,) that he has observed a doubling and internal contraction in the segments of his elegant *Boryna*. The examination we have just made of the internal organization of the conferva *Griffithsiana*, (Eng. Bot.) supports his observation. We have also found this in other *Borynas*. After all these characters, where shall we place this *Hydrophyte*? In considering its form, its interior organization that of its fine little branches and its fructification, one would be disposed to think it ought to be of the under genus *Gaillona*, but when this plant has been dissected and its organization studied, we find that it is more nearly allied to the under genus *Boryna*; its horizontal cut resembles much those species which compose it; it makes the passage, according to our opinion, from the *Borynas* to the *Gaillonas* and might remain at the end of the former, where Bonnemaisson has placed it. As these under genera form part of the genus *ceramiam* of Mr. Duby, we will name it, with this learned botanist *Ceramiam filamentosam*, but we will add to the generic characters, that the internal texture in several species presents a lining susceptible of contraction.

Fig. 2

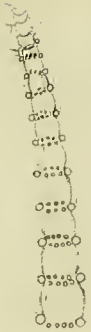
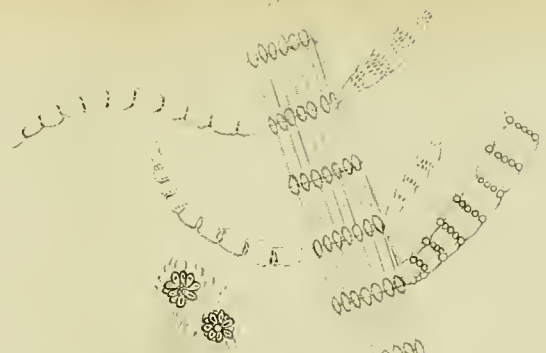


Fig. 1



Fig

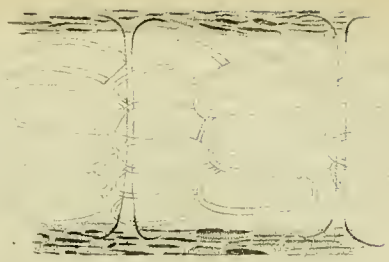


Fig. 8

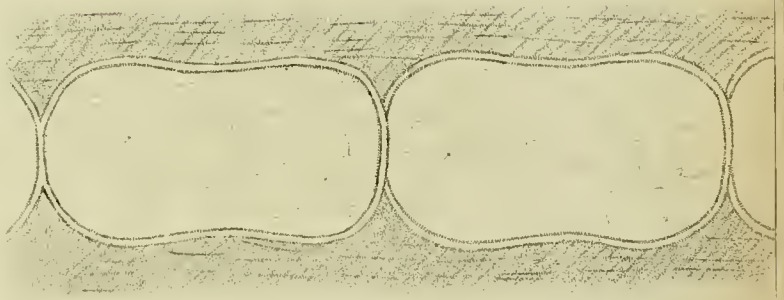


Fig. 4.

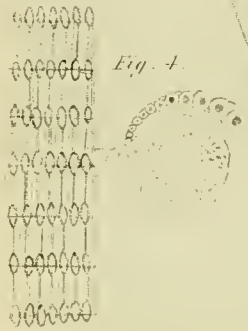


Fig. 3.

Fig. 9.

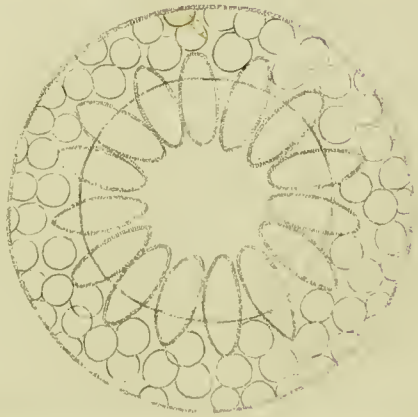


Fig. 6.

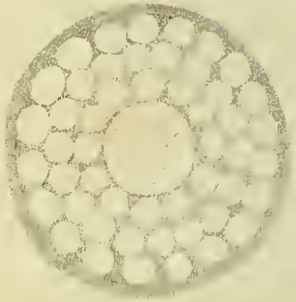
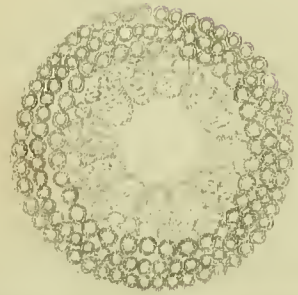
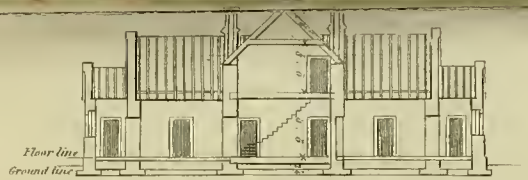


Fig. 5

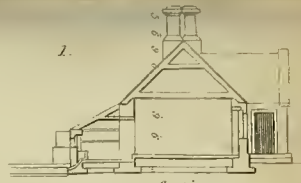


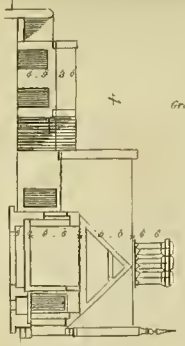
Organization of the Ceramium Tilamentosum.



Section Lengthways.


End Elevation

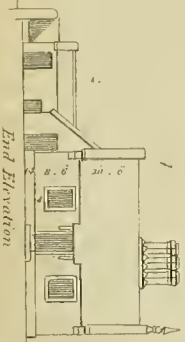

Section

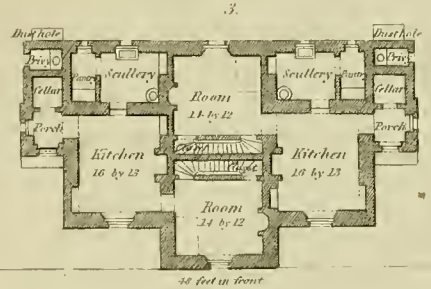


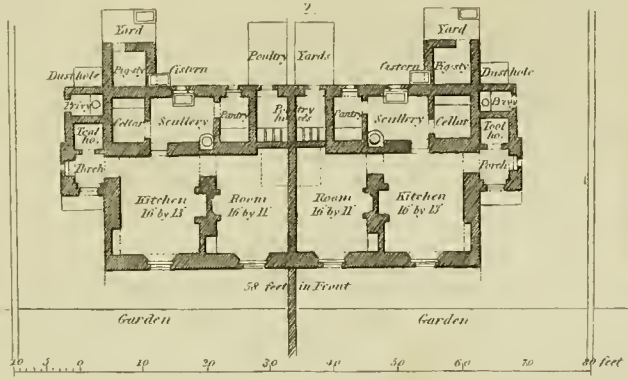

Elevation.

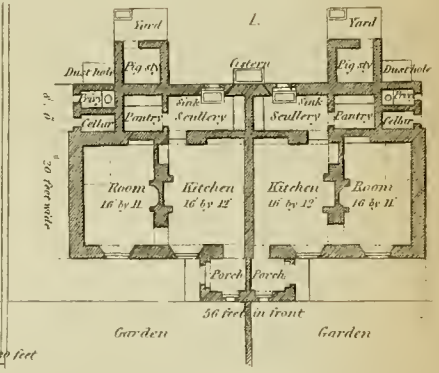

Elevation

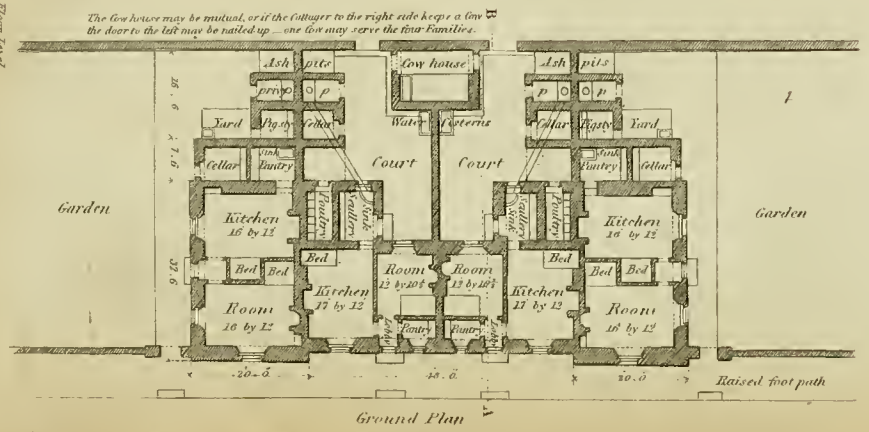

Elevation.

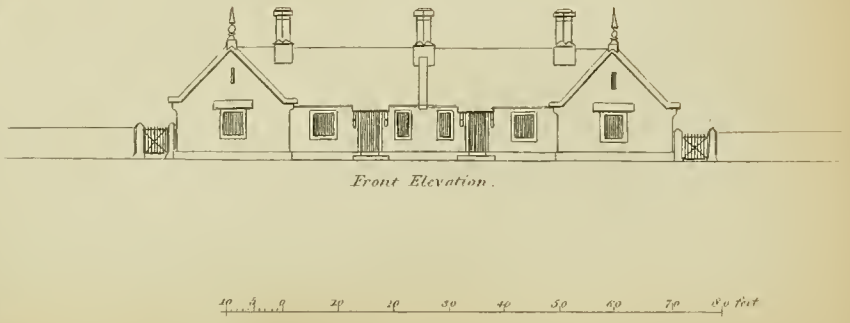











Front Elevation.

1. Cypripedium insigne.

2. Euonymus americanus.

3. Erica varia.

4. Habenaria ciliaris.

5. Digitalis canariensis

6. Scævola microcarpa

7. Helonias bracteata.

8. Sempervivum tabulæforme.

13. Castilleja coccinea.

11. Prunus candicans

15 Crotalaria verrucosa

16. Penstemon pulchellum

ON THE ORCHARDS OF LANARKSHIRE.

THE orchards in this county have long been celebrated and considered superior to any in Scotland. Within less than half a century they have also been greatly advanced as respects the enterprize and skill of the cultivators of them. But as this superiority does not seem to arise from any local and physical advantages over many other parts of the kingdom, but only through the perfection to which this branch of horticulture has been carried by human art, it becomes the more necessary that a knowledge of the Lanarkshire or Clydesdale orchard husbandry should be extensively disseminated. The following account will present the leading features of the system and its details:—

It is unknown when orchards began to be cultivated in Lanarkshire. It is at least very remote, and probably, like many other arts, that of the management of fruit trees was introduced by the clergy who came from Italy, and crusading warriors, whose travels gained them necessarily much varied knowledge. The art of engrafting, indeed, is spoken of in Scripture, and probably was one of the first discoveries made by man. Gardening at any rate in all its branches, independent of its sacred connexion, recommends itself naturally to the domestic, the secluded, and the contemplative; and it is a fortunate circumstance, that, at the reformation in Scotland, the orchards around the abbeys and monasteries, which had been skilfully reared by the monks and others connected with their order, were not destroyed, as the labours of the architect were.

The Lanarkshire orchards stretch along both sides of the noble river Clyde, from the borough of Lanark to Bothwell Castle, which may be sixteen miles, and amounting, by imperial measurement, to 1200 acres probably. This includes the small domestic gardens, as well as the large and regular orchards. The general aspect of these grounds resembles, as it has been aptly compared, an open book laid upon a reading desk, with the river's course forming the jointure of the leaves. The channel of the Clyde at the higher extremity of the orchard ground or district is about 260 feet above the level of the sea; but at the lower, it is not more than fifty. Frequently (to keep by the comparison of a book) the volume is not more than half open, so that the orchard field may be but a little above the level of the stream, and yet rise to one or two hundred feet laterally higher.

The soil of this orchard district is much diversified. Part of it is a deep and rich clayey loam, but much more is of a stiff and sterile nature, resting on a tilly subsoil, over sand-stone of a reddish-tinge, which alternates with the ordinary coal-formation. In some places the soil is more friable and sandy. On this last-mentioned sort of land the trees grow faster than on an adhesive clay, but do not yield so much, unless of the small fruit class. It does not appear, however, that any of these various kinds of soil are unpropituous to the growth of whatever is planted upon them; but manure in a great measure overcomes the natural defect, and skilful management is like second nature. Mr. Smith, who has published a map of the strata in England, says, that all the best orchards there are planted on a stratum of red marl. Though this precise sub-soil has not been found in Clydesdale, it is fully ascertained that a dry rocky sub-soil, if the ground above it be good, is uniformly favourable to orchard fruit. Sloping banks, which abound on the Clyde, are also advantageous situations for fruit-trees. It would appear that the roots stretch farther abroad in such a position than on level ground, whilst the sun and air necessarily reach every individual tree, since none of the neighbours can obscure it. The number of rills, too, that course their way down the face of banks and *braes* must be propitious to the fruitful sentinels that stand by them. Clydesdale is favoured as respects climate as well as locality. That which prevails in the southern counties of Scotland is usual here; whilst the western rains are moderated ere reaching this inland point, the eastern hoar frosts are tempered, and their chilling influence much neutralized.

Every one must know that a great deal depends on a proper selection of trees as respects the soil, exposure, and climate for which they are chosen. The scions should be from healthy trees, and grafted on true crab-stocks. The plants should be three years old after grafting ere they are transported into an orchard, and from three to four feet high, their roots well disposed, and the figure of the plant altogether handsome. At the same time, it is impossible to speak with certainty and to say what fruit-tree will thrive and be productive on any given soil or situation from its prosperity and value in another, even although to the view of man both should seem exactly alike. This, however, is an uncertainty felt in every department of agriculture, and, upon the whole, serves the best ends; one of which is, the calling for extreme vigilance and exercise of prudence as well as skill. Experience will ever in all such matters be the safest guide, and all experienced horticulturists will try a varicty of kinds of fruit-trees upon any given soil. Were there, indeed, no other advantage to be derived from such experiments, there is this, that different kinds of trees come into flower at different times, and though some, by one night's frost or blighting weather, may be destroyed for that year, others will have outgrown the trial, or not yet reached the danger. On Clydesdale as elsewhere, it is customary to plant and preserve standard-trees at proper distances from each other, and between them to have an early bearer. The Hawthornden, Carlisle Codlin, and Nonsuch, are very frequently appointed to these intermediate posts. They yield fruit the second year after they are planted, and though they soon canker and become unhealthy, they generally will be profitable till the time the standards begin to produce fruit.

The fruit cultivated in the Clydesdale orchard consists of apples, pears, &c.

The annexed list may be considered pretty correct.

EARLY APPLES.

Tam Montgomery.—A yellow apple, rather above the medium size, with small protuberances at the top-end, which the Clydesdale people call "cornering." The trees grow to a tolerable size, and are excellent bearers. The name is taken from a man in Ayreshire, who, for many years, had the only tree of that kind, and would neither tell how he came by it, nor allow any person to take a twig from it. But since his death, his name has been perpetuated by the extension of this valuable tree.

Early Almond.—Is a large round apple of a red colour, and of excellent quality. The tree bears early, and puts forth strong shoots, but is much hurt by canker.

Milford.—A small red coloured, long-shaped apple of good quality. The trees are strong growers, but rather shy bearers.

Juneating,—Is a small, fine-flavoured, solid, hard apple. The trees healthy and good bearers.

Drylaw Pippin,—Is a small yellow apple, having an uncommonly fine flavour. The trees grow well, and are good bearers.

White Marrow.—A large good apple of a yellow colour, and coroneted. The trees are healthy, and very productive.

Summer Strawberry,—Is a large beautiful apple, of a yellow colour. The trees are good bearers, but much given to canker.

Hawthornden.—A large good apple, rather long and coroneted, but do not keep long. The trees grow fast, with few branches, but are greatly hurt by canker.

Nonsuch,—Is a large apple of good flavour and quality. The trees grow well, but are very liable to canker.

Marigold or *Saffron Pippin,*—Is an excellent table apple, rather above medium size, yellow and red streaked. The trees are fine growers, healthy, and good bearers.

Early Magdalene,—Is an apple of medium size, and having a good flavour. The trees are ready bearers.

Bowyer's Lady Apple,—Is large and beautiful, of a red and yellow colour. The trees are healthy and excellent bearers.

Thorl Pippin,—Is a beautiful apple, much relished at table, and the trees are good bearers.

White Keswick Codlin,—Is a large yellow good flavoured apple, much relished at table, and coroneted. It is frequently made into jelly. The trees are good growers, and very productive.

Lemon Pippin,—Is a large, beautiful, yellow, and russetty fruit. The trees bear early, but are not very productive.

Oslin or *Arbroath Pippin*,—Is a good early table apple, and the trees grow freely by cuttings.

HARVEST APPLES.

White Cluster,—Is of a medium size, and of a beautiful red colour. The trees healthy, and good bearers.

Harvest Pippin,—Is an apple of good size, streaked red and yellow, and of agreeable taste. The trees grow well, and yield much fruit.

Wheeler's Russet.—An apple for the table, is of a moderate size, and rich flavour. The trees large and good bearers.

Dumbarton Pippin,—Is a small apple of a green colour, and rich flavour. The trees healthy, and very productive of fruit.

Golden Rennet,—Has red and yellow colours, streaked, and is good for the table or the kitchen. The trees are ready bearers.

Whistleberry or *Luffness Pippin*,—Is a large yellow apple of a rich taste. The trees grow well, but are shy bearers.

Walla-bona,—Is a large, long, coroneted apple, of a red colour. The trees are good bearers, but very liable to be hurt by canker.

Bloodheart,—Is an apple for the table, of medium size, rich flavour, and of a red colour, both on the outside and within.

Lady's Lemon,—Is a yellow apple, of medium size, and good flavour; but the trees are slow bearers.

Teuchet Egg,—Is a small apple of an orange colour.

Golden Mundi.—A good and beautiful table or baking apple.

WINTER APPLES.

Carse of Gowrie.—A large apple of yellow and green colours, excellent for baking. The trees bear well, but are infected with canker.

Red Marrow,—Is a fruit of medium size, of a red and green colour, and the trees are good bearers.

Winter Strawberry,—Is a fruit of medium size, of yellow and green colours. The trees are good bearers, but liable to canker.

Ribston Pippin,—Is a large green table apple, much cultivated in the west of Scotland. They keep long, but the trees are slow bearers.

Kentish Pippin,—Is a large beautiful table fruit, but not of the richest flavour. The trees large and healthy.

Red Cluster,—Is a hard round apple, small in size, of a red colour and good taste, keeps long, and the trees are good bearers.

Gogar or *Stone Pippin*,—Resembles the Red Cluster; and the trees grow well, and bear readily.

Norfolk Beaufin,—Is a large apple of green and red colours, used for baking, keeps long, and has a rough russet skin. The trees are good bearers.

Late Fulwood,—Is a large and excellent tasted apple, of a green colour, used chiefly for baking. The trees are large and bear readily.

Early Fulwood,—Is a baking apple of a dark red and green colour. The trees are large and good bearers.

Yorkshire Green,—Is a large green baking apple, excellent for sauces, and keeps long. The trees grow fast, but are much injured by canker.

PEARS.

Jargonelles.—On walls are very productive.

Crawford pears abound in every orchard.

Greg Honey.—A round early pear; trees large.

Auchan.—A good pear, and the trees good bearers.

Pear Saugh.—Large yellow fruit, and large trees.

Lady's Lemon.—A good early pear; trees great bearers.

Green Pinkie.—A small early green pear; trees productive.

Farrow Cow.—A large pear; trees large and good bearers.

Green Chisel.—A good pear.

Elshonhaft.—A rich pear; the trees large and productive.

Early Carnock.—An excellent summer pear.

The manner of planting and managing their fruit-trees by the orchardists of this range is now more simple and rational than was wont to be in vogue. They neither incur the *fruitless* expense of laying rich earth, where the soil is sterile beneath the plants, nor of paving a floor to prevent the roots touching ungenial substances; nor trenching the ground immediately around the spot where the tree is to be planted. The first two of these fanciful schemes are ineffectual, the last is injurious; for unless the whole orchard field is trenched, these laboured spots, particularly if the sub-soil is retentive, only serve to drink and hold water in them to the great damage of the trees unfortunately subjected to such mistaken kindness. The orchardists in Lanarkshire, now-a-days, merely delve, in an ordinary style, the ground; plant the trees from six to eight inches deep, and raise the earth for a foot or eighteen inches round them, a little above the general level, the better to prop them at the time rough weather tries their fixedness.

There is no uniform rule observed in Clydesdale as to the distance fruit-trees should stand from each other. Generally, however, they are closer than in English orchards. In some the rows are twenty-two feet apart, and the trees in these rows eleven feet separated. Others are thirty feet by fifteen. If early bearers are not intermixed, small fruit bushes or potatoes, &c. are cultivated. In managing both the trees and the ground a deal of care is taken. After they have been planted for five or six years, they ought to be divested of such branches as seem to point too near to the ground, or that rub against one another. With due caution, some of those that are too crowded together must be cut. Horizontal branches should be encouraged; they are much less liable to be shaken than those that tower aloft. All sorts of blotches ought to be cut off, and the moss that is apt to gather on them carefully removed. In taking the fruit, it should be pulled, not shaken, and this when the day is dry.

The orchard grounds are carefully drained; and in clay-lands, a covered furrow drain ought to be formed between every two rows of trees, besides the necessary open drains. These are more called for in orchard land than in any devoted merely to ordinary crops, from the overshadowing of the trees. Ropes of straw, or sprigs of broom, are tied round young trees to prevent them from being eaten by hares. The ground to be kept in good order requires not only to be broken up every few years, but to be well manured, particularly in sterile fields. The under crops raised, far more than repay the labour and riches thus conferred on the land.

It is impossible to give any precise information as to the rents given for orchard ground in Lanarkshire. The character of the soil, the age of the trees, and various other particulars, would require to be taken into every calculation to afford any useful and determinate light on the point. Neither is it possible to say what relation the orchard profits bear to the ordinary agricultural product of similar land in the immediate neighbourhood. One thing is notorious, that the great falling off in the prices of orchard produce, since the conclusion of the last war, brings the two systems of culture nearer an equality than before as respects pecuniary returns. After all, however, the orchardists of Clydesdale draw a much higher income from their lands than can be raised by any other course of agricultural management, even after counting every uncertainty, drawback, and failure. And should still farther depreciations occur in the price of fruit, the manufacture of cyder and perry is open, which we are led to believe might before this have been resorted to with advantage by the orchardists in this great fruit district of old Caledonia.

G. A.

LETTERS TO A YOUNG NATURALIST *.

It is with a very lively satisfaction, that we undertake to recommend to the particular attention of the public the work before us. We know of no other compressed within the same limits which seems to us so happily calculated to generate in a young mind, to sustain in the matured, and to renovate in the old, an ardent love of nature under all her forms. The volume consists of a series of letters, in which the author treats, in a familiar style, of the most interesting objects which the fields, the mountains, the rivers, and the ocean present to our contemplation. He goes into the history of each of those objects just far enough to render the outlines of nature intelligible to the least cultivated mind, and he adds reflections occasionally, of admiration, which, breathing his own feelings in eloquent language, are strongly calculated to excite kindred emotions in the hearts of others.

Speaking of the Ivy, Dr. Drummond observes :—

"Why is it that every one is pleased with the common ivy? There is a charm about that plant which all feel, but none can tell why. Observe it hanging from the arch of some old bridge, and consider the degree of interest it gives to that object. The bridge itself may be beautifully situated; the stream passing through its arches clear and copious; but still it is the *ivy* which gives the finish and picturesque effect. Mouldering towers, and castles, and ruined cloisters interest our feelings in a degree more or less by the circumstance of their being covered or not by the ivy. Precipices, which else would exhibit only their naked barren walls, are clothed by it in a rich and beautiful vesture. Old trees, whose trunks it surrounds, assume a great variety of aspect; and, indeed, it is a most important agent in forming the beauty and variety of rural landscape. It is also as useful as it is beautiful; and among its uses I would include the very thing of which I am now speaking, for I have no idea that the forms and colours in nature please the eye by a sort of chance. If I admire the ivy clinging to and surmounting some time-worn tower, and the various tints that diversify the parts of the ruin not hidden by it, I can only refer the pleasure I experience to the natural construction of the human mind, which the Almighty has formed to feel a pleasure in contemplating the external world around it. Who is insensible to the beauties of nature at the rising and setting of the summer's sun? Who can behold the moonbeams reflected from some silent river, lake, or sea, and not feel happy at the sight? None, I believe, in early life. When hardened in the ways of men—when the chief good pursued is the accumulation of wealth, the acquisition of power, or the pursuit of pleasure, so called—then mankind lose a sense of the beauties of nature; but never, perhaps, till then. A love for them is inherent in the mind, and almost always shows itself in youth; and if cherished at that period, by education, would seldom be destroyed or become dormant in after life, as it now so generally is.

"The ivy is of vast advantage to the smaller birds, as it affords them shelter in winter, and a retreat for building their nests in spring and summer. It is in fructification in October and November, and the sweet juice which its flowers exude supports an infinity of insects in autumn, while its berries are a store of nutriment for many birds in the early spring."

The wonders of the microscopic world have been in some degree examined by scientific men, but much remains still to be known of this comparatively hidden portion, though perhaps the most surprising of the whole of the works of nature. The power of the microscope exhibits the colours of flowers in a manner much more perfect than we can see with the naked eye. The author's observations upon the beauty of these great ornaments of the creation are in his wonted strain of fine philosophy.

"Why, for example, are flowers in general so exquisitely beautiful as we find them, if it be not to exhibit to us the hand of God, and to afford us, even in the colouring of a blossom, a manifestation of himself, and a rational cause for turning our thoughts towards him? Look with a magnifier at the flower of *London Pride*, or of *Forget me not*, and inquire of yourself why these minute objects are so lovely, why scarcely any of the larger flowers excel, and not many equal them: extend your observation to some of the minute insects, and reflect why they are dressed in colours as brilliant as those of the peacock: magnify a gnat, and consider the superb feathered antennæ which grace its head; examine its whole structure, see the wonderful mechanism which is in every part, the minute perfection, the elaborate finishing of this little being: remember that, in addition to the structure, there are its appetites and functions, its stomachs, and bowels, its organs of breathing, its muscles of motion, its several senses, and perhaps its passions. Think on these, but not with the transitory admiration which we often observe in persons who for a first or second time see objects in a microscope. Be not content with the cold acknowledgment that it is one of the wonderful works of nature, and then let it slip from your memory. I tell you it is the work of God; and I believe that the too liberal use of the term *nature* has given rise to much of the apathy with which the objects of the creation are regarded. It is very true, indeed, that when we say nature produces a plant, or an animal, the true meaning is, that God does so, nature here being used as a synonymous term; but still the word has so many applications, and it is employed in such a variety of ways, that we insensibly get into the habit of using it, in natural history and other sciences, as if it were some inferior power, or agent, acting by itself; and we talk of the works of nature without any impression being on our minds at the time that they are in truth the works of the Deity himself."

The whole is meetly wound up with reflections upon natural religion, the power and goodness of God, and the love of truth; which, like those already noticed, are marked by a pleasing tone of piety without cant, of knowledge without pedantry, and of unbounded benevolence, without a particle of morbid fondness, towards all the objects of the creation.

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* *On the Study of Nature, and Natural Theology.* By James L. Drummond, M. D. Professor of Anatomy and Physiology in the Belfast Academical Institution, &c. 3rd Edit. 1834. London: Longman & Co.

ON THE CONSTRUCTION OF COTTAGES FOR THE LABOURING CLASSES.

The comfort and respectability of the working classes is of primary importance to the prosperity of the state. Next to a good early education, probably nothing more certainly conduces to their moral virtue than comfortable dwellings and small gardens. We at present confine ourselves to the first article here mentioned. Hitherto, the manner in which our manufacturing population have been crowded together, especially in large towns, and the decayed or ruinous piles of buildings into which they have been huddled, have greatly tended to disease, and, what is worse, to encourage profligacy. Attention to this matter, however, is beginning to mark the present generation of philanthropists; nor do we despair of seeing, in the course of a few years, a mighty alteration in the exterior condition of the industrious labourers of our country. Certain it is that much, besides the power of example, may actually be done by proprietors of land and men of wealth. Neat cottages may be erected in the neighbourhoods of towns, as well as upon large landed estates; and we proceed to give a short description of several designs (see Plate 40) which we think admirably adapted to such purposes in any quarter of the united empire, whether built of brick or the more hardy material, stone. The plan and arrangement of these neat, convenient, and comfortable dwellings are distinguished particularly by their compactness. They present, in short, *multum in parvo*.

We have just one other general observation to submit, which regards the requisites of cottages, and which these designs dextrously exhibit. Besides economy and convenience, each family requires a certain extent of variety of accommodation for the sake of *decency*. This has hitherto been seldom considered as a matter essentially necessary. If there was space found for the poor man and family, wherein cold, wind, and rain were excluded, it was thought enough. It most probably was one lank, bare, and empty apartment, without fire-grate or loft, the folding door and a window or two being the whole of the *superfluous* providing to gratify the eye of the new tenant, a sight sufficient to turn the tide of a parent's emotions to despair and profligacy. But the poor parents had children, and with boards, box beds, and tattered blankets, strove to protect themselves from indecent community, more than the landlord did to screen them from wind and rain.

EXPLANATION OF THE PLATE.

A few moments' examination of these designs are sufficient, without any minute description of them, to make any one understand and appreciate their excellence, They in short speak sufficiently well for themselves. In such cottages as are represented in fig. 1 and 2 of Plate 40, the outer door usually opens directly upon the fire place, which, besides other discomfort, generally occasions a misdirection of the smoke. Here, the evil is well and neatly avoided by means of a porch. It will be seen as another good contrivance, that the poultry-house is placed so as to receive not merely the shelter but some of the warmth of the cottager's apartments; and that in a small and convenient form every necessary provision is made as regards variety of divisions and cleanliness.

The third figure in Plate 40 is of rather a picturesque form, but combines all the comfort and convenience, independent of this, which is generally lost sight of by fanciful designs. In this plate there will be observed a gradation of accommodation, rising from the first design. They are all double, however, which adds to their warmth and their cheapness. Still they may be completely separate and distinct, as regards every accommodation and right. *Fig.* 2 has a pavilioned roof, which is made also to hang over the side-walls. *Fig.* 3 has bed-rooms over the centre, and lofts over the kitchens; thus making each cottage belonging to this design a house of three apartments, with a closet, &c.

Fig. 4 combines four distinct dwellings. The design consists of a centre and two wings; each of the latter forms one dwelling-house, fronting a garden, completely closed in by itself. It will be observed that the fire-places in all of these plans are placed in inside walls, and that the wall cupboards are also in inside walls, otherwise they must be cold and damp. The combined cottage shewn, seems an admirable plan. Two of the dwellings have poultry-houses, the other two, pigsties; and there is one cow-house placed in the middle of the back court, which will in general be found sufficient.

We might lay down a number of rules and heads of a specification for the construction of such cottages, whether of brick or stone mason work, but which, according to the view we are taking in this notice, it is not our purpose to speak of. The depth of the excavations for foundations, the style and kind of flooring, we leave to the wisdom of the builder. We would recommend that the division walls of double cottages be carried close up to the slates; that a dwarf wall be built across under each room that is floored, for supporting the sleeper joists; that the floors be raised considerably, and, as the situation of the building will always suggest, duly above the level of the ground on which it stands: that the whole area immediately connected with the buildings be properly drained, and that four openings, eight inches square, and grated, be made below the wooden floorings for ventilation and preserving the floor. Cottages should not be thatched, nor any part of the work superficially executed, if profit as well as comfort is looked to.

We need not give an estimate of the expenses which any one of these designs will incur when fully followed out. We shall only say, that the saving latterly, if every thing be observed which has been said, will be as remarkable as are the compactness and comfort of these cottages.

ON THE DAIRY HUSBANDRY OF AYRSHIRE.

Every art that has been carried to a high degree of perfection finds some one country or district of a country the seat of its reign. This is frequently attributable solely to physical causes, by which the materials to work on are confined to particular regions. But sometimes, and probably more frequently still, the matter is wholly referable to man's choice, and the particular direction of his powers. Thus the growth of tea or the propagation of the silk-worm are never likely to distinguish the highlands of Scotland, but we do not see why the whisky that is distilled there might not be produced any where else, provided the grain out of which it is made was found. Still, within very narrow limits of a country or district, some arts and manufactures will be seen to preserve themselves entire, as if hemmed around by impassable barriers; for these barriers are the habits and the prejudices of mankind, the most obdurate and insurmountable of any on earth.

It may in the next place be remarked, that the skill that is so illustrious as to lend a distinctive fame to a whole territory, may after all, be alone due to a limited and confined section of that territory. Thus it is with the *Dairy Husbandry* of Ayrshire; for we are prepared to shew, if called upon, that this art as understood there, might be advantageously introduced and prac-

tised in many other parts; and that though confined to a comparatively narrow circle, it yet lends celebrity to the kingdom. It holds with the *Dairy* as it does with the *Grain Husbandry* of Scotland. The latter is confined, in its high perfection, to certain districts on the east coast of the kingdom especially, whilst the former has its seat on the west coast. Nevertheless, both branches are so zealously and skilfully pursued in these opposite directions and limited quarters, that both the one and the other have conferred upon the whole country, a high and distinctive name. To be sure, with regard to the eastern branch of husbandry, it must be observed, that the nature of the soil and climate forbid its advantageous adoption in the west; but the dairy of the west might and should be much more extensively practised in the east than it has ever yet been; nay, it deserves to be understood and introduced into many parts of the united empire, as the account we are about to submit, though necessarily an outline, will, we trust, establish.

We apprehend and feel strongly assured, that every extensive proprietor and farmer; that even every gardener, peasant, and householder, to whom a single milk cow is an object of attention, should take into consideration the view and matter we have now entered upon. The writer speaks from actual observation and experience, directed to rural affairs for these many years, in various quarters of the united kingdom; but chiefly in Ayrshire: that county lending a name to the dairy art, equivalent to that of Scotland. Nay, the making of cheese belongs in its highest style but to one of the three divisions of Ayrshire, viz. that of Cuningham, although it has thence found its way, over a much more extensive tract of country, including the greater portion of the shire, and also of that of Renfrew and the lower part of Lanark. The information afforded by Mr. William Aiton, of Hamilton, will also be taken advantage of, who is the most judicious and enlightened writer on the Scottish dairy system, that has ever appeared.

Milk is probably the most essential and wholesome species of food used by the human race. It is the sustenance of childhood, and often of old age, and the milk of cattle cannot find an equal in importance except in bread, "the staff of life;" it must accordingly be a highly necessary thing, that mankind should know how this great article of food is to be most abundantly provided, and also most profitably used and manufactured into the different forms of which it is capable. The subject therefore leads us to consider, what are the best modes of rearing and cultivating cattle (the Bos tribe is of course solely understood here), and next how is the produce of cattle to be most profitably managed.

It might be useful as a preliminary matter, to consider the nature of land best fitted for the dairy, and relatively what is the most profitable branch of husbandry, in certain given situations and soils. But this would lead us, at present, into a too lengthened discussion. We only say generally, that land of a medium or inferior quality, or where the climate is wet, will yield a much higher rent if judiciously managed, on a dairy system, than if devoted to any rotation of constant cropping. It may be most confidently asserted, that if the farmers in the counties of Ayr, Renfrew and Lanark, were compelled to change their dairy system for any other, that of cropping for example, they could not give above three fourths of the rent they now pay. The demand for, and the prices of that species of agricultural produce, have never declined so much as that of grain, or even less than butcher's meat.

We learn from Mr. Aiton, that on the authority of the Board of Agriculture, the quantity of herbage that will add 112 lbs. to the weight of an ox, will, when bestowed on a dairy cow, of an ordinary good breed, and in a fair condition to yield milk, enable her to give about 2,700 imperial pints of milk: and that generally in Scotland 17 pints of milk will yield an imperial pound of butter; and the butter-milk will sell at one penny for three pints. Of Ayrshire or Dunlop cheese, (as it is more frequently called) it will take 120 pints of milk, to yield from 16 to 17 lbs. avoirdupoise: it can easily be ascertained, therefore, whether the beef, or those quantities of butter and cheese are most profitable. Nearly 385 pounds, or 27½ stones imperial of full milk cheese (that is of milk as it comes from the cow) will take 2,700 pints; and if so many pints be made into butter, they will yield nearly 157½ pounds, besides the butter-milk, which may average about half of the whole that has been churned. The average price of beef for seven years past, has not exceeded six shillings per stone; and the 112 lbs. or eight stones, of course amount to 2*l.* 8*s.*, while 27½ stones of cheese, at five shillings per stone, the average price paid to the farmer during the same period of years, amount to 6*l.* 17*s.* 6*d.*; and the average price of 157½ lbs. of butter, at eight-pence per pound, for a like course of time, amounts to 5*l.* 5*s.*, and of the butter-milk to 1*l.* 17*s.* 6*d.* more, both being 7*l.* 2*s.* 6d.

Compare in the next place the rise on the prices of grain, then of butter and cheese within the last sixty-five years. While oatmeal, for instance, has not advanced more than 50 per cent. on an average during that period, the price of cheese has risen from 200 to sometimes 300 per cent., and butter from 300 to 500 per cent. during the same time; although these later kinds of produce have been imported into Scotland to an immense amount. It may be noticed, that though a dairy requires an extent of labour and outlay considerably greater than the fattening of cattle, there will still remain a vast balance in its favour. Neither is there much more expense incurred in bringing a cow to the period when she has her first calve, than in making her fit for fattening for the shambles. And after giving milk for seven years, she may be fattened to very considerable advantage, thus turning the matter of rearing greatly in favour of the dairy cow.

But to come to the dairy cattle of Ayrshire. It may first of all be observed, that the excellence of the breed is not of very long standing; neither is it clear to what it is owing. The very limited importation of kinds from other quarters, could not have produced that which is now so celebrated, and accomplished it within the last fifty years. It is pretty evident that the matter must be attributed to the pains taken in the cultivation of the indigenous breed, by careful crossing and judicious feeding, first of all, in the district of Cuningham in Ayrshire. From that spot the breed has extended to many of the Scottish counties; and it is also in high estimation in England. And indeed they are fully worthy of such celebrity; for they are possessed of all the most important requisites of cattle;

they give a more copious draft of milk than any breed in Europe; they fatten as fast and cut up as well in the shambles as any other. They are tame, quiet, docile and hardy, and particularly exempt from disease.

In breeding, particular attention is paid to the shapes of the bulls; those are preferred that have the greatest resemblance to a fine cow, at the same time suiting the size of the bull to the cow; taking care that he be not too large. As to the most approved shapes of the cow; her head should be fine and narrow at the muzzle; her eye small and lively; her horns wide-set, slender, and turning upwards after having bent inwards; her neck long, thin, and tapering towards the head; shoulders also thin; fore quarters light; hind quarters capacious; back straight; carcase deep; buttock's fleshy; tail long and fine; legs short and fine; udder broad, and stretching well along the belly, showing itself in rear of the hind legs also, but not flabby; and the teats planted widely asunder. The skin and the hair should also be fine; indeed all the parts of least real value must recommend themselves by handsome features and points. Such are the qualities that skilful breeders look after and desire. These cattle vary in weight from twenty to sixty stones English, with fat sinking offals; and their prices at present run from 10*l.* to 15*l.* sterling; which are much under what they brought several years ago.

In rearing calves, of course those from parents the most highly esteemed will be preferred; and the most fashionable colour is dark red, intermixed with white; the red greatly prevailing. The best period to choose them, is when after about six weeks' feeding on milk, they can be turned out to grass in May, to have all the fine weather and grass of the year. They are never allowed to suckle their dams; but are fed from a dish. For the first few days they should not be allowed to have what they would take; and after six weeks or so pure milk diet, cheaper and less delicate food must be very gradually introduced. It is always a safe rule, however, to be kind to them as long as possible when young; the attention will be amply repaid in the cow, not only as respects the abundance and continuance of their milk diet, but in giving them the best pasture for the first summer of their lives. It is good feeding and treatment when young that brings them early to be fit to give milk, and that abundantly: and such a style of management is the great secret of bettering the breed. A wise dairy farmer is as indulgent to his cows, as the tenderest groom is to a race-horse: a good dairy-maid not only will not hurry their pace in the field, but she handles them and talks to them with all the kindliness possible. They literally know her voice, and court the hand that cherishes them.

The milk cows are fed in summer on such pasture as the farm produces; care should always however be taken, that they be not stinted; nay, it is a great damage to the cow, when she has to make it a day's work to fill her belly. It should be frequently filled; and she should often indulge herself with an hour's rest, care being taken that water is at her will. The writer knew a farmer, who, when his wife complained of the cows giving little milk, would say, "I'll sell one, and you'll have more." In summer they are housed during the night, and their fodder is chiefly oat-straw. But of late years a great deal more pains than formerly is taken, to let them have some succulent addition. And as the period of their calving approaches, some substantial grain is added, though in small quantities. The grain should be bruised in a mill, the smaller the better; bean-meal seems now to be in highest estimation. For some time after calving this good feeding should be continued, especially if the grass be too young to yield a mouthful. It is prudent in summer weather to keep the cows out in the field all night. This not merely makes them hardier, but without a great deal of care and feeding within doors, there will be a sad falling off in milk after a night's imprisonment. Let it be understood that every judicious farmer allows at least, in all kinds of food prepared by the hand for his cows, a portion of salt, which they relish highly.

A cow to give much and good milk must be in a thriving and good condition, Mr. Aiton, who has been at vast pains to ascertain every point regarding dairy husbandry, satisfactorily shows, that the average returns of the better sorts of cattle in Ayrshire, when properly attended to, will amount to 6,000 imperial pints of milk every year each cow; the inferior sorts, of course, yield much less. And when speaking of a years milk, nine of the twelve months may be taken as a suitable portion for a cow to be kept in a milking plight.

The cow houses ought to be capacious, well ventilated, and kept clean; the side walls high; no loft to obstruct the ready escape of their breath; and numerous apertures in the building, to admit of the introduction of pure air. Dryness more than heat is required. The paths within and towards the house should be well paved, that they may be easily kept clean. Thin flags of stone about four feet square, are usually placed on each side of the stalls, two cows being to a stall. The best style of fastening the cattle, is by an iron rod, about twenty inches long, fixed in a perpendicular position, by the side of the flag, that a chain may be allowed to slide up and down, and thus give the animal's head sufficient freedom for feeding, without the possibility of goring its neighbour sideways. In front of the row of cows, there is usually a stone trough to hold their food; there should also be a parallel passage. The other dairy houses, connected immediately with the manufacture of butter and cheese, together with the proper utensils, fall to be considered, after these articles of produce have been discussed.

In Ayrshire and the neighbouring dairy districts, but chiefly in Renfrewshire, which supplies Paisley and Glasgow, besides other towns, with the greatest proportion of butter used in them, the best article of the kind manufactured in Scotland, and perhaps to a much larger extent, is to be found. Here the mode of proceeding is very simple. It is the practice to churn the whole of the milk, which is not generally observed or known elsewhere. The milk, as soon as drawn from the cow, is placed in shallow coolers, and stands for twelve to twenty-four hours; when the cream has risen to the surface, the coolers are emptied into the churn, where the butter is to be made. If another milking is thus prepared, and ready to be poured into the churn, (which is of the standing kind) before the former has begun to sour, it may be added safely; but if otherwise, or if the first be even approaching to acidity, the admixture leads to fermentation and injures the milk. Great care is taken not to allow the *coagulum* of the milk in the churn to be broken, after it begins

to become sour, till the operation of churning is set about.

As a proof that the process of butter making in the west of Scotland is not a complex one, it seems enough to state that the farmers who supply Paisley and Glasgow with this sort of produce, not only churn all their milk, but do so almost every day in the week. Plunge churns are usually found to contain about 100 Scotch pints, (a Scotch pint is two English quarts) when worked by the hand; but when machinery is applied, 150 or 200 pints are churned at a time. In a few minutes after the operation is begun, as much warm water is poured into the churn as raises the temperature of the milk from fifty degrees or so of Fahrenheit, (which will be that of the dairy-house) to seventy or seventy-five. The water must be slowly poured in, not dashed, and the churning must proceed during the same time, without fail. In autumn the milk is rich, and more water may be applied than earlier in the year, when the serum is more abundant; and probably one pint of water on an average may be near the proportion, to be added to every five pints of milk. But much will depend on circumstances, that cannot all be detailed. We may say, however, that the character of the feeding, and of the milk of individual cows, requires the observance of all who would be expert and good hands in dairy work. Let it be particularly attended to, that the milk be not too much heated, or churned too hastily. From two to three hours is a good allowance of time for the operation.

We have already alluded to the value of the butter milk in the west of Scotland; we now add that it is not only a palatable but a delicious liquid, and finds amongst the working classes a rapid sale. We do not wonder that in England the pigs should monopolize the beverage: for whatever may be the cause, the fact is, so far as we know, that the butter-milk is not fit for human beings. There is a bitterness and nauseousness in its taste, that leads us to suspect that the butter cannot be perfect which has been extracted out of it. But in the North, the peasantry very generally, as well as the humble citizens in the manufacturing towns, prefer the sour liquid for their porridge, to the pure sweet milk in the state it comes from the cow; and we venture to affirm that their health and strength is not inferior to any class of the human race.

The Ayrshire or Dunlop cheese is thus made:— When such a number of cows is kept as to yield milk sufficient for a cheese of tolerable size at each milking, the milk is passed through a strainer to clear it of every impurity, into a tub or vat of sufficient size for the purpose. The rennet is applied the moment all the milk has been collected; and as soon as the process of coagulation is completed, the dairy maids' hands are, gently at first however, employed, the curdling being then very soft, to draw off the whey. The curd is all gradually broken, but in such a manner, and such a time, as neither to extract substance that would go to enlarge the curd, nor be so tardy as to allow it to become unmanageable. Where the milk at one milking is not sufficient to make a cheese, it must be collected from two or more milkings; and this is done in the shallow sort of coolers mentioned before, which are of wood, stone, lead or tin. When the cheese, after such a collecting, is to be made, the cream is skimmed off the cooled milk, and poured into the large vat through a strainer; whilst the residue, which is thin milk, must be brought to a proper heat, and then added. The heat of the whole mass should be about that of new drawn milk. Were the cream, which is put into the curd vat, heated, its oily particles would melt, and be lost to the cheese.

The temperature at which the milk is kept, from the time it is drawn from the cow, till it is formed into cheese, ought to be carefully attended to. If kept much above 55 degrees of Fahrenheit, it will not cast up the cream properly, and will soon sour; and if below that degree of temperature, the process of coagulation goes on slowly, the cheese is soft that is made from it, and the whey with difficulty drawn off and separated.

After the curd has been well broken, and cut by means of a knife, and as soon as the greater part of the whey has been drawn off, salt is applied, at the rate of about half an ounce to every pound of cheese, which the dairy housewives have a marvellous knack at hitting by the judgment, that a glance of the eye enables them to form. The curd, however, must still have submitted to a very minute chopping, before the salt can intimately mingle with it. After this the whole is put into a cheese-vat, surrounded with a piece of thin cloth made into canvass from coarse lint, and at first gently pressed by a weight of a very moderate amount, lest the still tender curd should be injured. Ere long, however, three or four hours from the time the whole operation was set about, the cheese-vat is put under the press: it is afterwards changed a few times in the course of the day, not merely by having dry cloths applied, but by reversing the now regularly formed article in the cheese vat. After coming from the press, the cheese is exposed to a considerable degree of drought, and is turned every morning and evening. It is thus treated for a few days, and then last of all laid upon boards in the store room, only to be turned every second day or so. Such is the simple operation;—skewers are never put into a cheese to extract the whey; it is never sweated, nor rubbed with butter. It is proper to add, that the entire management of the cheese dairy is confided and conducted by women, and this leads us merely to notice, a point far from unimportant, connected with this species of rural husbandry, which is, that the females are bred and kept to a most becoming employment, which goes no small way to give a valuable character to the entire body of the rural population. Dairy farms too, are, it may be said, necessarily limited; they not only call for the industry of the husbandman's daughters, but the sons cannot afford to be *gentlemen*, but have to work along with their fathers in the fields. Accordingly and therefore it is, that the peasantry of the west of Scotland are now, and have long been, the most enlightened, the most religious, and the most industrious of any even in that nation.

A milk house should be so large as to contain at least one day's milk of all the cows on the farm; and still larger if butter and skim milk cheese are made. It should be shaded from the sun as much as possible; and the best covering is thatch and turf, in order to exclude the heat of summer and the cold of winter. The window should be on the north side, that the sun's rays may not enter, and it should also have two ventilators, covered with brass wire and gauze cloth to keep out insects and mice. The floor should have

a well joined pavement, that no milk or dirt may lodge in it, and it should uniformly be kept dry and cool. Every thing, in short, about the milk house, should be sweet and clean, and though it must be near the cow house, it must yet be so distant as not to be polluted by any effluvia from the cows. The dairy house must also be so constructed, that the steam from the boiler may not reach the milk. But if the milk house and dairy house be distant from the cows, or from each other, a covered passage should run between them, as the milk is soon affected by the rays of the sun, by rain, or by exposure to the air. A storehouse is also necessary; and it should not be damp, nor very dry; the barn floor is very commonly used in Ayrshire, especially in the height of the summer season, or the ground story of a house where the current of the air is not too great, nor the light too powerful.

The dairy utensils in use throughout the west of Scotland are few and simple, a general recommendation of the implements handled in any art. The milking pails are of wood; the churns are wrought, for the most part, with a staff, the head of which is as broad and round as the circuit of the upright pump in which it is plunged; and the cheese presses, now-a-days, are chiefly wrought, or the pressure obtained, by means of a lever power, by far the best sort of machine hitherto known for the purpose. Such a press can be carried, when not filled or charged with cheeses, in a person's arms, from one place to another, and it occupies so little room, as to stand in almost any bye corner. Besides, it will press half a dozen cheeses as quickly as one, provided the maker has given height to it. Without a drawing, however, it cannot be described intelligibly. Wheels, sliding pressure board, and long lever spear, for weights to be hung on, are the leading features in this press. The other dairy utensils are common and few in number, not requiring to be here mentioned.

We have, owing to the limited space allowed us, been obliged to give a very cursory outline of the west of Scotland butter and cheese making processes. But enough has been said to shew the excellence of the Ayrshire breed of cattle, and the profitable mode in which their milk can be used. We conclude with asserting, that if the high rents paid by the dairy tenantry, and their habits and general comfort be matters worthy of consideration, the branch of husbandry followed out by them is the best that they can adopt, and that it should be greatly more extended over Scotland, not to speak at present of a much wider domain.

ON ENCLOSURES.

The great purposes served by enclosures are protection and shelter. We are not sure that man in a rude state, so soon as he fixed himself permanently in one spot, might not erect some sort of visible landmark, by which he individualized to his own apprehension a definite portion of property, independent altogether of the idea of protection. But it is obvious that wherever there were other inhabitants, whether of his own species or inferior orders of animals, fences would become necessary that he might protect what had accrued to himself, from injury and robbery. In some cases the line that divided was in a great measure ideal, and only preserved by large stones erected at distant intervals of space; such a division if kept honestly by, was sufficient to show where one man's possession joined that of his neighbour. But landmarks might be removed, which, we read, was considered a heinous offence. An expedient was sometimes resorted to, of an affecting kind, to strengthen the evidence as to precise localities. Children who had arrived at an age such as usually enable them to treasure up in their memory an event that had once made a deep impression, were conducted to certain places, and there so satisfactorily flagellated, as was not likely ever to be forgotten by them. These places were of course, at the time, admitted by the conterminous proprietors to be correct and precise points of separation; nor do we doubt, that the consecrated urchins frequently visited and refreshed their memories, with all the surrounding symbols that were beheld at the moment of their endurance.

But this species of registration was liable to serious mischances, and other less frail expedients were resorted to. The most natural and accessible were stone walls, continuous mounds of earth, and rows of trees. Any of these were sufficient to form a permanent landmark, which could not be removed, and therefore the best, and still customary fence against the encroachments of man. Another most important purpose is served by enclosures; they protect cultivated crops from the depredations of the inferior animals; and such animals as are domesticated and reared by the care of man, from wandering too widely to their own damage and danger. And lastly, properly constructed fences, shelter both crops and animals from storms and inclement weather. Herdsmen and the best trained dogs could not be of any service in this latter capacity; nor could they at any time during day, much less in the night, completely circumvent or controul the stock committed to their charge. Hence the value and the necessity of sufficient enclosures.

One other purpose is served by the expedients we are now speaking of, and by no means an unimportant one, we mean the pleasure conferred by the sight of a well sheltered and divided territory. But this rather belongs to the subject of landscape gardening than the objects at present before us, viz. the origin, the economy, and the proper construction of land enclosures.

After the ring fence which divided one man's property from that of his immediate neighbour, it is obvious, that subdivisions of his own land would come to be thought of. The simplest and most natural principle was certainly that which pointed out the richest and best watered spot for his dwelling houses. Next the garden came to be hemmed in, then such bits of land most accessible from his dwelling, had to be cultivated to rear the grain, his means and circumstances suggested as necessary and profitable; and thus the long established order of things was kept up, which in the northern parts of Britain went under the description of *Infield* and *Outfield*; the Outfield was appropriated solely to depasturing the live stock; the Infield to rearing crops for the sustenance of the cultivators family; together with fodder for the winter food of his cattle. This half barbarous system continued through what may be called, the feudal ages of agriculture, and down to within these last hundred years.

It was somehow or another discovered at length, that the cereal crops became more productive, by the amelioration effected in the soil by grass; and that grass land supported more live stock by being occasionally cropped with corn. This new light destroyed the Outfield and Infield system, and gradually led not only to a new style of subdividing and enclosing farms, but to all the great improvements that distinguish the present rural economy of the island, especially in the north of England, and the more fertile counties of Scotland, which we

venture to affirm are unrivalled in the particular we are displaying, whether in ancient or modern times. In the few practical observations we are about to submit, those districts, therefore, shall be taken as the model for the construction of enclosures and fences.

There seems to be no department of rural economy less understood or attended to than the one we are now upon. Most fences are comparatively useless, very many of them are also wasteful. It sickens him who has a taste and a moderate knowledge of farming, or any one who has but hastened through the well-managed districts of the north, to see what is very prevalent in the vicinity even of London; the huge and ugly forest of thorns and bushes that are huddled together upon some unshapely mound of earth; the parallel ditch, more like a foul canal than an open drain, which it should be; and the masses of noxious weeds that rankly grow, flourish, and yield seed within and beyond the whole extent of these abominations. One should suppose that the waste of land was an item not unworthy the attention of him who has a high rent to pay; but even worse than this are the destructive vermin those wildernesses of bush and weed harbour and foster, and the quantity of vile seeds that are wafted every year from these nurseries of foulness.

Where the white thorn will grow, the following is a prevailing mode of management in the north. Hedges are double or single; the double is generally found now-a-days where the fence is a boundary between two farms. But, as it is nothing more than two single ones united, the mound out of which they grow being between them, we shall at once describe the simplest example. A ditch is dug about two feet and a half deep, three feet wide at the top, slanting to one and a half at the bottom. This is pretty near the general size, where cattle are frequently to be enclosed, and a considerable body of surface water is at times to run. Shallower and narrower conduits in other circumstances are sufficient. The soil dug out of the ditch forms an embankment on one of its sides. The turf is turned first upside down; some of the best soil is carefully spread, and the young thorns laid horizontally upon the level. Some more of the best soil is spread above the plants, and the remainder piled up and well clapped, so as with the ditch to form in front almost a sufficient barrier. But the fence is completed by what is called a *cocking*, that is, a strong range of thorns, cut to about the length of three feet, stuck into the top of the wall of earth. This range is allowed to stand for some years till the thorns be in themselves a perfect hedge.

It is necessary to keep the young thorns and the ditch clear of rank weeds for the first two or three years. And this is accomplished by two *weedings* in the year, gently and most carefully conducted. We should have mentioned that the slender tender plants, by being laid in a horizontal position, are supposed to acquire a greater strength, near the root, in forming the knee, which they naturally do as they advance in age and grow upwards; besides, by this expedient, the hedge is backed and protected so long as it exists. It is advisable to lay these thorn plants thickly, but never in more than one row.

The weeding of the hedge, and the cleaning of the ditch, whenever it begins to fill up with mud, or to be choked with trash of any kind, necessarily draws and shakes a good deal of the best soil from the roots of the plants. This evil is dextrously avoided, by a small shelf being formed a little below the thorn roots, and some fine soil laid thereon anew; the whole is then clapped and faced up as at first, for these things must all be attended to till the hedge masters every ordinary impediment or obstacle.

There are various ways of mending gaps in an advanced hedge. If young plants are inserted, care must be taken to surround them with new and rich earth. Frequently a sprightly branch of a neighbouring bush is bent down and across the vacancy; its points are introduced into the soil, that they may strike. A notched stick holds the elastic branch to its proper position, which is simply assisted by its having been cut half through at the bending joint. This cut must always be on the under side, and struck upwards, to protect the core of the branch from wet and injury.

It is usual to encourage a laoguid hedge by cutting it close to the root, and *cocking it* behind, as at first. This operation is usually performed when the field in front of it is under crop. Immediately after this, the strong roots send up a multitude of spiral shoots, that, in a few years, if properly attended to, will almost exclude the little birds from entering its bosom; or rather, that shelters them from enemies of every kind. In forming a hedge that may stand for generations, let the thorns grow to a goodly size and height. With a hedge-bill the whole should be dressed up into a wedge-like form, having the acute angle at the top. This roof, or hogged mane, answers admirably all the purposes of a fence, without bringing decay upon it. The branches at the root may extend two feet from the stem, and, by the gradual slant to the top of the steep roof, every branch has its due share of sun, air and rain, without injury to those below. After the thorns have thus been put into proper shape, nothing in after years is necessary but to mow the yearling twigs to the established form and surface; thus lifetime after lifetime enabling and forcing the fence to thicken and strengthen into a vegetating wall.

In some places the thorns when planted are laid above a little wall of stones, which is raised about two feet above the level of the field, and only one stone thick; the earth supporting the back which the roots of the plants reach and enter. Where thorns will not grow, and stones are to be procured, the cheapest, and indeed the best fence is, what goes by the name of the *Galloway Dyke*. It is a wall of dry stones, between four and five feet in height. The stones are built close for about two feet from the ground, and then carried to the top with others, so placed as to admit of the light between every two of them. It is easily rebuilt, and sheep or other kinds of farm stock are deterred by the open appearances, from attempting to climb or leap such an obstacle. The top row of stones should be laid asunder and across the fence; smaller ones filling up the distances, whilst the ends of the larger project on both sides.

Many other varieties of fences might be specified and described; but the two we have given are the best for such districts as can produce or foster them. We have a few sentences to submit as to the size, form and position of fields enclosed within farm fences. And nothing can be more obvious than that, if a man was allowed to pitch his tent where he chose, square or nearly square enclosures would be the most convenient and profitable. In lack of this choice, he must do the best he can; and it is, therefore, impossible to lay down any but very general rules for his guidance. Soil, the nature of the produce reared, the position of the farm houses, will direct him in many things. There is one good general division to be observed in grain farms; there should be twice as many enclosures as there are *breaks* in the course. Thus if a six years' rotation be thought the most profitable there should be twelve enclosures, two of which are always under the same crop. This tends to equalize labour; to allow such fields to be connected or disjoined as may suit soil, distance from the farm houses, and convenience of passage through intervening fields. Again, if possible, every field should consist of one sort of soil. Again, the ridges, if it can be managed, should always run north and south, that both sides may equally have the benefit of the sun; and, if the land be steep, they should not run, particularly on light soil, from top to bottom, but slanting across; this saves the soil from being washed by heavy rains from the higher parts to the lower. As to the length of ridges: it is not advisable that they should be very long, and chiefly for this reason, that too great a body of water thus collects and has a run in the furrows before reaching a main ditch or open drain. A cross ridge can always be formed where such a wearisome length characterizes a field.

Clumps of trees afford shelter to cattle, and ameliorate the climate. Where the fields is square its corners are very suitable parts for such a feature and purpose. It is hardly necessary to add, that every field, especially where cattle are pastured, should be supplied with water. And it is in Scotland usual, where a small stream runs between two farms, that part of it is entirely within the grounds of the one now, and of the other afterwards. For if the water run forms not a sufficient fence. it would otherwise be necessary that each farmer lined the stream's border on his own side with a wall or hedge. Where the matter, however, is arranged as we have stated it to be, one fence serves the two; the only inconvenience attending the practice, arises from the circumstance that such a fence has every now and then to cross the stream which calls for water gates, that require looking after. But this would lead us beyond our present limits, and to the consideration of farm gates; a subject deserving of a distinct notice.

ON THE COTTON PLANT.

(Concluded from p. 116.)

Much, moreover, may he effected by introducing into India the different species and varieties which are already successfully cultivated in other countries; and here the chief thing is not to restrict ourselves to too small a number of varieties, because they happen to be those which at present produce the best kinds of cotton. Not contented in America with possessing already the best kinds of cotton, they have tried those of other countries, to see if there were not among them some suited to the peculinrities of their country and climate. Mr. Spalding, in an interesting letter published in the evidence before the East India Committee, informs us that the cultivators in America confine their attention to such plants as are of annual growth. 1st. The *nankeen cotton*, introduced at an early period from China; this is abundant in produce, but the seed, covered with down, produces wool of a dirty yellow colour, which does not bring the price of the other short staple cottons. 2d. The *green-seed cotton*, with white wool, which, with the former, is grown in the middle and upland districts, whence the latter is called *upland cotton*, also *short staple cotton;* and, from the mode in which it is cleaned, *bowed Georgia cotton*. This, Mr. S. says, was cultivated in Georgia and Carolina previous to the revolutionary war, and considers it impossible to trace whence it was introduced, but supposes it may have been from Smyrna by one of the southern states. To this it may be objected, that as the *G. herbaceum*, with greyish seed, is the kind generally cultivated in Asia Minor, this *green-seed cotton* is probably one of the cultivated varieties of *G. hirsutum*. 3d. The *sea island*, or *long staple cotton*, which is distinguished by the black colour of its seed, and the fine, white, strong, and silky long staple by which it is surrounded. This is grown in the lower country near the sea, and on several small islands, which are not very distant from the shore. This was introduced into Georgia from the Bahama Islands, where it had been brought from a small island in the West Indies, celebrated for its cotton, called Anguilla.

In attempting the introduction into India of new kinds of cotton, it would appear advisable to include in the experiments every kind that can he procured from all parts of the world, whether they afford in their present site the best or only an indifferent kind of cotton; for some which do not appear so good may find a more suitable locality in some parts of India. Another consideration, not less important, is to extend the experiments over as wide a field as circumstances will at present admit of; and it will be extraordinary, indeed, if the extended coasts and wide-spreading plains of the Indian empire do not afford a sufficient choice of soil and climate for some one, if not several, of the superior varieties of a plant which is already cultivated in every part of the country.

With respect to the improvement of the kinds already in cultivation in India, it will not be useless to call attention to the evidence given before the Committee of the House of Commons on the Affairs of the East India Company, where several places are mentioned which already produce some fine kinds of cotton —as the neighbourhood of the Silhet Hills, which is said by Mr. Bracken to produce a cotton equal to any from the South Sea Islands, and which he states that Mr. Fialay, of the Calcutta Cotton Mills, considered equal to any cotton he had ever seen. There is also a fine variety in the neighbourhood of Dacca; though the fine muslins of that name are no doubt more owing to the workmanship than to the raw material. Mr. Colebrooke (*Bengal Husbandry*, p. 140) states, that the best cotton imported into Bengal is brought hy land from Nagpore, in the Dukhun, to Mizrapore. Another kind, superior in the length and fineness of its staple, is brought by a land-carriage of more than 500 miles from Ameraweti, a well-known mart in the Dukhun, situated about thirty miles south of the city of Elichpore. The best cotton on the eastern side of India is now said to be grown in Guzerat, and that from Cutch is particularly fine in the staple, and well cleaned; but the finest is produced at a village near Manyrole, in Kattywar. The great improvement in the Tinnevelly cotton is well known, and owing to the introduction of foreign varieties, especially from the Isle of Bourbon. The Seychelle cotton should also be tried, as well as the different kinds which are produced in Siam and the several islands of the Indian Archipelago, as well as of the Pacific Ocean. That of Pernambuco appears particularly desirable, as it is said to improve the further it is carried into the interior. The Brazils and West India Islands afford endless varieties; and the trials with the seed from Georgia and the Carolinas, as well as from Egypt, should be repeated in every part of India, but especially on the coast of Cutch, in Malwa, and in the north-western provinces of India. With respect to the best mode of cultivation, it is unnecessary to enter into all the details, as they are given in works lately published, available to every one, especially the *Tropical Agriculturist*, Captain Basil Hall's *Travels in America*, *Poiret's Dict. des Sciences Naturelles*, tom. xi.; but as it will be useful to contrast the principles with the practice in India, I have made the following abstract, chiefly from the first-mentioned work:—

"The soil best adapted for the cotton is a light and sandy soil, particularly if held together hy a little clay or calcareous earth, and mixed with a small portion of vegetable matter; but volcanic deposits are said to be the most favourable, and the banks of rivers which are overflowed, and covered with mud. A moderate degree of moisture is essential, but too great aridity is injurious, and must be counteracted by irrigation; and as an excess of moisture induces the production of a profusion of leaves and flowers, though the latter fall off, and the roots rot, it must be obviated by drainage. No great depth of soil is required, but it ought to be light and friable, so that the delicate fibrils of the root may penetrate in every direction. The tap root of the perennial species should, however, be able to descend to some depth; the sub-soil, therefore, should not be hard. Two or three ploughings are necessary to pulverize the earth, destroy all weeds, and expose every particle of the soil to the atmosphere, and to light and heat. In China the soil is harrowed after each ploughing, and the latter is made twelve or fifteen inches deep. If the soil he barren or exhausted, manure suited to the nature of the soil is added, in China, after the last ploughing, and consists of mud from the bottom of ditches,

ashes of all kinds, and oil-cakes. Previously to being sown, the seed is generally soaked in water; oil has been recommended for the purpose, but lime-water would be preferable. The sowing takes place in Georgia from November to April, in lines or furrows; the latter may be five feet apart. In America and the West Indies, where the land has not been previously cleared, the practice is to fell and set fire to the timber, and dig holes for sowing the seed. These may vary in distance, but are often eighteen inches apart, and about as deep. From twelve to twenty or thirty seeds are sown in each hole, as soon as possible after ploughing, digging, or hoeing, and are covered with one or one-and-a-half inch of soil. The most important operation is weeding; this is repeated every eight or ten days in China, until the bushes put forth blossom, and every month in Guiana; it ought to be carefully performed, so as not to injure the young fibrils; it is useful not only in removing weeds, but also in turning up the soil. When plants are three or four inches high, all, except three or four in each hole, are pulled up; at the end of the third month, all the plants but one are withdrawn; in Georgia, after a month, six or seven are left in each hole; at next hoeing, only one, or the two which are most apart. When the remaining plant is eighteen or twenty-four inches high, only twelve inches in China, the top is pinched off, that the lateral branches may shoot out, which, after a time, are treated in the same manner to favour the formation of flower and fruit. This process is objected to by Von Rohr. The blossom generally appears about the end of July, or beginning of August: pods open about six weeks after the blossom, and the crops begin in September, both in Georgia and Guiana; but most of the cotton is ready about the middle of October, and the whole of the first crop is not got in before the end of December in Guiana; when, as in India, Christmas rains occur, the plant afterwards sprouts out new shoots and blossoms, and about the end of February the picking may be resumed, and continued to the middle of April. The ground is carefully weeded between the crops: women and children are employed in picking the cotton out of the pods, and, as moisture is injurious, the gathering is not commenced until the dew is dissipated; and as the pods ripen in succession, it is repeated at short intervals; the cotton is then sorted, that which had fallen on the ground is kept separate, the whole cleaned, and then dried in the sun: this hardens the seeds, and enables them to separate more easily from the cotton, and is moreover useful in preventing the latter spoiling from heating. If left too long on the plant, the withered leaves and calyx become mixed with the cotton, as is so frequently the case in India.

"In Guiana the perennial cotton produces a full crop the second year, and remains productive for four or six years. In China it is kept only three years; young plants are put in wherever deficiencies occur. In Guiana the pruning of the perennial cotton-plant takes place in the second year of its growth, after the whole of the produce is gathered in. May is considered the most favourable month, when the trees are cut to about four feet high, premising with a good weeding of the ground. Dry weather and the early part of the day are recommended, that the sun may dry up the wounds."

ON PRACTICAL IRRIGATION AND DRAINING *.

When agriculture began to attract particular attention, the inferiority of wet land would soon become apparent. This inferiority would be most obvious in the temperate regions of the globe; because the effects of excessive moisture could only there be always perceptible in the soil. It was in Europe that agriculture received the first impulse towards improvement, and agriculture still flourishes in Europe in greater perfection than any other portion of the globe. To the Romans belong the honour of improving the general culture of the soil in Europe, towards which draining contributed as much, perhaps more, than any other single operation. The precepts which they have bequeathed to the world in their writings on that subject evince the observant faculties of that extraordinary people. They were fully acquainted with the method of clearing their fields of surface water, and they also understood the art of directing springs, by means of drains, to places where they could do no mischief. This art, however, appears to have been lost from the overthrow of the Roman Empire to the revival of learning after the dark ages. After that period to as lately as the middle of the eighteenth century, it had been practised in a much inferior manner than by the Romans. The small drains, with a stone set on each side, and one covering them, situate between the soil and the subsoil, which modern improvements in agriculture have discovered, are very inferior structures to those described by the Romans.

It was reserved to a farmer in Warwickshire, of the name of Elkington, so lately as 1764, to introduce what may properly be called a system of draining, superior even to that of the Romans, and which, in peculiar situations, cannot be surpassed in efficacy. The leading theory of his system is, that, though moisture be seen on the surface of the soil at any given place, the spring of water from which it originates lies deeply seated in some porous stratum. His practice consequently is, to discover, first, the seat of the spring, and then to cut a drain deep enough to intercept the water, and carry it away where it can do no mischief. The drain may not be able to reach the seat of the spring, though it may be properly situated in relation to it: in that case he bores holes with iron rods, or sinks wells through the bottom of the drain to the spring, in case the quantity of water be great. The water has then liberty to rise through the bored holes and wells to the bottom of the drain, on which it flows away innoxiously.

These principles of Elkington have been, and may be, applied successfully to the draining of lakes, bogs, and morasses; of hollow portions of land containing deep soil, but much injured with water from the adjoining rising grounds; and of undulating ground subject to bursts of water. All these situations will be found to be connected with alluvial or rocky strata, of different structure and compactness; and in any situation which possesses alternate strata, of various degrees of permeability, these principles may doubtlessly be employed with unfailing success.

It is the object of Mr. Stephens, in his Practical Drainer, to enforce and illustrate these principles in every variety of situation to which they are applicable; which will be seen by the following extracts:—

"*Open Drains.*—In draining bogs or moss where the drains do not reach the hard bottom, ditches are preferable to covered drains, for should stones be used when the bottom is very soft, they would sink, whereby the drains would become useless: indeed, in all situations where the ground will allow it, the principal drains should be open; and when they can become the division of fields, which, in many instances, is practicable, that should never be neglected. It would be unnecessary to give any particular directions for their depth or wideness, as that must depend on the quantity of water they are to convey, and on the nature of the soil and situation in which they are made: one rule, however, may be general, that the width at the bottom should be one third of that at the top, which gives a sufficient slope to the sides, and the fall or declivity should be such as the water may run off without stagnation. In very soft soils, a greater degree of slope on the sides may be neces-

* The Practical Irrigator and Drainer. By George Stephens, Land Drainer. 3d edit. 8vo.

sary; and in all cases where it is meant to receive surface water only, none of the earth thrown out should remain upon the sides, but should be removed to the nearest hollows; for, when this is not done, their use is in a great measure counteracted. The earth, when left on the sides, prevents the surface water from getting into the drain—its weight causes the sides to fall in—makes it more difficult to scour or clean it—and adds much to its disagreeable appearance in the middle of a field. In cases where the augur or wells are obliged to be resorted to in open drains, they should never be made in the bottom, but on one side, with the outlet eight or ten inches above, which will prevent surface or flood water depositing any sand or sediment in the bore-holes whereby they might be injured.

" *Shoulder Drains.*—Any surface water or partial springs in moss and marshy grounds, on which the large drains have no effect, and where stones cannot be used on account of the softness of the soil, is most effectually removed by means of shoulder drains. The method of making them is, by digging a trench from fourteen to sixteen inches wide, the sides perpendicular to the depth of two or three feet, and then by taking out the last spit with a spade, the breadth of which is three inches at the bottom, and four or five at the upper part, a shoulder is left on each side, on which the sod that was first taken up is carefully laid with the grass side downwards, or, if it is not strong enough, others must be cut in the vicinity, and the remaining space filled with the loose earth a few inches above the level of the surface of the adjacent ground. Drains of this description, when properly executed and moles kept out of them, will operate for a great number of years.

" *Covered Drains.*—In every instance where covered drains are used, their dimensions depend on the depth, the quantity of water they have to carry, and the kind of materials they are filled with. When the depth does not exceed five feet, two feet wide at the top will be sufficient; but, whenever it is more, the width should be increased four inches for every foot in depth, and the width at the bottom should be twenty inches, which will give a sufficient space to build a substantial conduit. When this is not attended to, and the bottom of the drain is made so narrow that the stones of which the sides of the conduit are formed are obliged to be set on their edges and the covers laid on them, in this insecure state, they, in many instances, fall down before the drain is half finished, causing it to burst in a very few years, and often forming springs in the driest part of the field.

" In digging drains, there are several circumstances which, if attended to, will greatly facilitate the execution of the operations, such as having the stones laid down by the upper side of the lines of the drains before the work is commenced, to be ready in case the sides should slip or fall in, which often happens in mixed soils, as, when this precaution is not attended to, the expense is not only considerably increased, but the work is done in a less accurate manner. Particular care must also be taken that the bottom of the drains is made with a regular descent, so that the water runs from the one end to the other without standing dead; and where bore-holes or wells are necessary, they must be made before the conduit is laid, in order that the sand may be removed which the water may throw up from the stratum below, and would otherwise be deposited in the bottom of the drain which would thereby be rendered useless. The dimensions of the conduit depends upon the quantity of water it has to carry; thus, in an outlet drain, it requires to be larger than in a cross drain, which has only the water collected in itself to discharge. In general cases, therefore, the conduit in an outlet should be made from nine to twelve inches square, and, in cross drains, from four to six inches square. When the bottom of the drain is very soft, it must be laid with flag stones, to prevent the materials from sinking; and the stones forming the side walls of the conduit must all be laid on their flat beds, and covered with strong covers well joined together, and packed at their ends; the space above, in clayey soils, must be filled with stones, broken to the size of a man's clenched hand, to within twelve inches of the surface of the ground, which remaining space must be filled with porous earth. Before the earth is put into the drains, the stones must be covered with straw, rushes, or turf with the green side downwards, to prevent the loose particles from subsiding into the crevices among the stones. In cases where all the water comes from bore-holes, or rises in the bottom of the drain, eighteen inches of small stones above the covers are sufficient; but when it comes from the sides of the drain, it is necessary to fill the drain above the covers with some kind of porous substances, six inches higher than where the water breaks out: the neglect of this precaution is the reason why so many drains have so little effect in drying land.

" In making covered drains, particular attention must be paid that they are not carried into the outlet at right angles, as their ends should be turned down in the direction the water is to run a short space before they join it, to prevent the water in the outlet depositing any sand or sludge in their mouths, which will be the case if this is not attended to; indeed it often happens, on almost every estate, that the drains are stopped and rendered useless from this precaution being neglected. The mouths of the drains ought also to be well built and secured with iron gratings, to prevent vermin from getting into them; and it must be examined from time to time, to see that it is in proper repair and the outlet kept a sufficient depth, so that the water coming from the drains may run away freely, otherwise it will remain stagnant in them to the great injury of the land. To obviate this, it is advisable that a person should be appointed on every estate, under the superintendence of the factor or land-steward, to go through every field that has been drained, at least once a year, to examine the mouths and outlets of all the drains, and make any necessary repairs as he proceeds. Such an arrangement, I am convinced, would be very beneficial, and is highly necessary, as I have often found drains completely stopped in a year or two after they were made, and the land beginning to be wet again from this cause alone. Managers of landed property ought to be very particular in this department of rural economy; indeed a clause ought to be inserted in every lease, binding both proprietor and tenant to keep the mouths and outlets of drains in proper order at their mutual expense.

" *Rumbling Drains.*—These are well adapted for removing water from alternate beds of clay and sand ridges, and also water confined in porous soils with an impervious bottom, as well as for receiving surface water from clayey soils. Their depth, in the two former cases, is generally about four feet, and in the latter from two to three feet. and twelve inches wide at the bottom; they are filled with stones, broken to the size of coarse road metal, to within ten or twelve inches of the surface of the ground, and, in clayey soils, the remaining space with porous earth. Wood is sometimes used in duties of this description instead of stones; but, as it is liable to decay soon, and the drains will consequently be destroyed, it cannot be recommended when stones, gravel, smithy-danders, or even coarse sand can be procured. Indeed, whenever my opinion has been asked with regard to making drains with wood, my uniform answer has been against such a practice, having had experience of so many instances in which wood had been employed, although stones might have been procured in the same field, of the land having to be drained again within a few years; and, consequently, I could not consider myself acting candidly towards my employers in advising it. An instance of this occurred at Wallhouse, Linlithgowshire, a few years ago, in which I was called on to make a plan to drain the ground immediately around the mansion-house, and, having examined it, I found that the whole had been drained some years before, and the drains filled with thorns and other brushwood which had decayed, and, the clay having fallen in, springs were formed in many places in the lines of all the drains. What surprised

me was to find them laid off in such a manaer that there was no occasion to allow any of the old lines; and, having inqnired who was the engineer, I was answered your late brother. Being, however, aware that he never recommended drains to be filled with wood, if stones could possibly be procured, and more especially that he would not have done so in draining pleasure grounds, where, in most cases, no expense is spared to do the work in the most substantial manner, I suspected that the work had not been executed according to his plan, and, upon making further inquiry, I found that my suspicions were correct, his specification having directed them not only to be made with stones, but also to have been from two to three feet deeper, which was exactly what I caused to be done, whereby a complete drainage was obtained.

"*Tile Drains.*—These are best calculated for removing surface water, and are made just wide enough to let the tiles be put easily into them; they are, in most cases, about twenty inches deep, but tiles may be used at any depth, provided the drain is filled with broken stones, or other open materials, to nearly the surface of the ground. The tiles should always be well burnt, and laid on soles, as whenever this is neglected, which is too often the case where tile draining is now practised, their duration will unquestionably be very short, whereas hard burnt tiles will last for almost any length of time without mouldering down. The expediency of using tiles instead of stones depends entirely on circumstances; for, if stones are to be found, whether by collecting on the surface or quarrying within the lands that are to be improved, or even if they can be procured within a mile of the operations, tiles should never be used. Stones are preferred to tiles in making drains in all kinds of soils, provided a sufficient quantity are used; but where only a few inches of broken stones are used in a drain, well-burnt tiles laid on thick soles, and covered with turf of any other porous substance, would answer the purpose better; and in porous soils, when the water is found at or near the bottom of the drain, if six or eight inches of broken stones were used in packing and covering them, a more substantial drain would be formed. In clayey or mixed soils, where the water enters the drain at different depths, stones, gravel, or smithy-danders, are the only materials that can be used with advantage; in any case, however, where the tiles are used, the space above them must be filled to the surface of the ground with some porous material, otherwise the drains will be useless, and the undertaking will prove a complete failure."

Upon the whole, we have no hesitation in expressing our opinion that Mr. Stephens' treatise is the best practical manual in every respect of the several subjects of draining, irrigation, and the embankment of rivers, of which it treats, that we have met with.

ON THE USE OF KELP COMBINED WITH PEAT-ASHES AS A MANURE.

In 1832, a Scotch acre of dry stony ground, a great part of which had formerly been the channel of a rivulet, was prepared in the way usually followed in the cultivation of turnips.

A quantity of sea-weed was collected, dried, and burned in the same manner as for kelp; but, instead of allowing it to form into a solid mass, it was removed from the fire in a calcined state, in order to save the expense of afterwards grinding it.

Of the ashes thus manufactured, twenty bushels were allowed to the acre, and distributed in the drills with a barrow made on the principle of bone-dust sowing machines.

When the turnips which were sown on this acre sprouted, they had an unhealthy green, or rather yellowish appearance, but, after some time, several patches in the field seemed to be growing luxuriantly, while others seemed to retain their sickly hue. Upon a careful investigation into the cause of this phenomenon, it was discovered that wherever the ground was deepest, and the ashes of the sea-weed had been most mixed up with the soil, the turnips were best; and, on the other hand, that where the ashes, not being mixed with the soil, came in contact with the seed, the turnips did not at all thrive. In cleaning the ground preparatory to drilling it, the weeds were collected into heaps and burnt on the spot; and it was observed that, on the site of these heaps, the turnips were very nearly as good as those on an adjoining piece of ground which had been manured solely with dung.

In order to find out if the kelp ashes would have any effect upon an after-crop, the turnips were not consumed upon the ground. Last spring the land was merely harrowed and sown down with oats and grass-seeds, and the oats, which have been lately reaped, were quite as good as those which grew on that part of the field manured solely with dung, except that they came up thinner. The young clover is, however, thicker, and altogether looking better than any crop of the same kind I have ever seen in this part of the country.

As the result shewed that the quantity of kelp ashes used in this experiment was far too great, at least for the first crop, and as the plants which grew on those portions of the field where the ashes of the weeds were scattered were so far superior to the rest, the experiment was repeated this year with a mixture of kelp and peat ashes. A field of six acres was sown with this mixture, distributed in the drills as before, at the rate of six bushels of the kelp ashes and twenty-four of the peat ashes to the acre; and although, from various causes, the turnips were not sown till the first week in August, they have grown remarkably well, and now, little more than two months from the date of sowing, the average weight of them is from 2¾ lbs. to 2½ lbs.

Supposing kelp to be worth 3*l.* 10*s.* per ton, each bushel of the kelp ashes would cost about two shillings, and the peat ashes, which were in this instance collected from a number of poor cottagers in the neighbourhood, who had been directed to keep them dry and free of all sort of extraneous matter, cost sixpence per bushel, so that, upon the whole, the price of the manure was twenty-four shillings per acre. The labour of men and horses being exactly the same as in sowing bone-dust, it is unnecessary to offer any calculation of this part of the expense.

If this experiment be found to succeed elsewhere, as it has done here (and there can be little doubt that, after a little more experience, and in abler hands, it will succeed much better), it may one day open up an important source of revenue, if not to kelp proprietors, at least to their poor tenantry, no individual of whom uses any sort of fuel but peat. At first it was somewhat difficult to convince the poor people from whom the peat ashes were obtained for the experiment above detailed, that they would be really purchased from them, and the consequence was, that at first one-half of the quantity which each family with a little attention could have supplied was thrown on their dunghills, where, though it was eventually of some service, they would never think of putting it, if they knew that they could convert it into money. A man, however, was paid twenty-five shillings for his winter's ashes, and this year there is little doubt that he will, besides enjoying the comfort of a better fire than he was accustomed to have, earn at least 2*l.* for what, till now, he had been in the habit of throwing at the threshold of his door, as an invitation to cholera, or some other loathsome disease.

A. M.

DESCRIPTION OF THE PLATES.

HABENARIA CILIARIS.

Gynandria Monandria.—Linn.

Orchideæ.—Juss.

Herbaceous, either destitute of a stem, or forming a kind of tuber above-ground (pseudobulbus), by the cohesion of the bases of the leaves, or truly caulescent. Roots in the herbaceous species fleshy, divided or undivided, or fasciculate; in the caulescent species tortuous, green, and proceeding from the stem. Leaves simple, quite entire, often articulated with the stem. Pubescence rare; when present, sometimes glandular. Flowers in terminal or radical spikes, racemes, or panicles; sometimes solitary.

A native of North America, in meadows and drained swamps, from Canada to Carolina. It is a beautiful plant, difficult of cultivation: frequently imported into this country, but it never lives long here. It flowers in June, from roots received the preceding winter; they should be potted in loam and vegetable earth, and kept in a frame, under glass.

SCÆVOLA MICROCARPA.

Pentandria Monogynia.—Linn.

Goodenoviæ.—Brown.

Tube of the calyx adnate or half-adnate, rarely free; the limb 5-cleft, or 5—3-partite, sometimes entire or obsolete, generally equal, persistent. Corolla monopetalous, more or less irregular, deciduous or marcescent; the tube cleft behind, sometimes cut into 5 deep pieces, whilst the calyx is nearly free; the limb 5-parted, 2- or 1-lipped; the disk of the segments lanceolate, plane; the sides or wings of a thinner texture, elevated, with an induplicate æstivation, rarely obsolete, or wanting. Stamens 5, free, alternate with the segments of the corolla; filaments distinct; anthers distinct or cohering, linear, vertical, fixed by the base, undivided, 2-celled, the cells opening longitudinally; pollen simple or compound. Ovary 2- or 1- (rarely 4-) celled, with indefinite or definite erect ovules; sometimes with a gland between the two anterior filaments; style 1, simple (rarely divided); stigma fleshy, obtuse, undivided or 2-lobed, surrounded by a somewhat membranaceous, cup-shaped, entire or 2-lobed *indusium*. Pericarp, when the seeds are indefinite, a 2- rarely 4-celled capsule, or in consequence of the abbreviated dissepiment almost 1-celled: dissepiment generally parallel to the valves, the axis bearing the seeds;—when the seeds are definite (1 in each cell), a drupe or nut, bearing the seed at the base of the cell.

This is a native of New South Wales: it was first raised by Mr. Curtis, in 1793, as he informs us in his Magazine, from seeds, which were brought accidentally to England in specimens of earth.

It flowers in summer, continuing long: the plant is perennial, of low growth: it must be kept in the greenhouse in winter: it is propagated by cuttings, and should be potted in sandy loam and peat.

SEMPERVIVUM TABULÆFORME.

TABLE-SHAPED HOUSE LEEK.

Dodecandria Dodecagynia.—Linn.

Crassulaceæ.—De Cand.

Sepals 3—20, more or less combined. Petals equal to them in number, and alternate with them, inserted into the bottom of the calyx. Stamens inserted along with the petals, either equalling them in number, and then alternate with them, or twice as many, those opposite the petals the shortest; filaments distinct, subulate; anthers oval, 2-celled, bursting longitudinally. There is a nectariferous scale at the base of each ovary. Ovaries as many as there are petals, and, opposite to them, placed in a circle, distinct, 1-celled, tapering into the stigmas. Carpels several, 1-celled, opening longitudinally and internally. Seeds attached to the margin of the suture, variable in number. Albumen thin, fleshy. Embryo straight: radicle turned towards the hilum.

A native of Madeira, introduced, according to Mr. Haworth, in 1815. It is a curious plant: before flowering it has scarcely any stem; and the leaves, though numerous, are so closely pressed together, as to form one compact, quite flat surface.

When it shoots into flower the leaves decay, as does afterwards the whole plant: it can therefore only be increased by seed. It must be protected from the frost in a dry greenhouse, and potted in sandy loam.

DIGITALIS CANARIENSIS.

CANARY FOXGLOVE.

Didynamia Angiospermia.—Linn.

Scrophularineæ.—Juss.

Calyx divided, persistent. Corolla monopetalous, hypogynous, often irregular, with an imbricated æstivation, deciduous. Stamens generally 4, didynamous, rarely equal, sometimes 2. Ovary many-seeded, 2-celled: style 1; stigma 2-lobed, rarely undivided. Capsule (or very seldom a berry), 2-celled, 2—4-valved, the valves entire of bifid, with the dissepiment either double, from the inflexed margins of the valves; or simple, parallel with the valves and entire; or opposite to them. Placentas central, adnate with the dissepiment or separable from it. Seeds numerous, albuminose. Embryo included, straight: radicle directed towards the hilum.

This is a native of the Canary Islands: it was cultivated in this country so long ago as 1698, but is by no means a common plant.

It produces its elegant flowers in June and July; they are sometimes succeeded by ripe seeds: it may also be increased sparingly by cuttings. It is necessary to keep it in a greenhouse in winter: it should be potted in light loam.

ZIGADENUS BRACTEATA.

Hexandria Trigynia.—Linn.

Melanthaceæ.—Brown.

Perianth free, petaloid, 6-partite, tubular by the union of the claws, with the segments in æstivation often involute. Stamens 6: anthers often turned outwards. Ovary 3-celled, many-seeded: style trifid or tripartite: stigmas undivided. Capsule often separable into 3, sometimes with the valves bearing the dissepiment in the middle. Seeds with a membranaceous testa, (neither black nor crustaceous). Albumen dense, fleshy.

This is a native of Carolina and Georgia, and was introduced in 1802; it flowers in September.

It is nearly hardy, requiring only the shelter of a frame in winter. It should be potted in peat earth, and may be increased sometimes by separating the roots.

CYPRIPEDIUM INSIGNE.

NOBLE LADIES' SLIPPER.

Gynandria Diandria.—Linn.

Orchideæ.—Juss.

Perianth superior, ungent, of six segments in two rows, the three outer usually coloured, of which the odd is uppermost in consequence of a twisting of the ovary, and the one called the lip (labellum) is undermost; this latter is frequently lobed, of a different form from the others, and very often spurred at the base. Stamens three, united in a central column, the two lateral usually abortive, and the central perfect, or the central abortive and the two lateral perfect, rarely all perfect. Anther either persistent or deciduous, two, or four, or eight celled. Pollen either powdery or cohering in definite or indefinite waxy masses, either constantly adhering to a gland or becoming loose in their cells. Ovary one celled, with three parietal placentas; style

forming part of the column of the stamens. Stigma a viscid space in front of the column, communicating directly with the ovary by a distinct open canal. Impregnation taking effect by absorption from the pollen-masses through the gland into the stigmatic canal. Capsule inferior, bursting with three valves and three ribs, very rarely baccate. Seeds parietal, very numerous; testa loose, reticulated, contracted at each end, except in one or two genera; albumen, none. Embryo a solid, undivided, fleshy mass.

This beautiful plant is a native of Nepal. It flowers in December and January, in the stove, which appears to be necessary to preserve it.

It flourishes in vegetable earth, with a portion of sand, and may be increased slowly by separating the roots. There is something fascinating about this plant, as well in form as in arrangement of its colours; delightful to every eye, but doubly so if we view it as formed by the kindness of God.

EUONYMUS AMERICANUS.

EVERGREEN SPINDLE TREE.

Pentandria Monogynia.—LINN.

Celastrineæ.—BROWN.

Sepals four-five, combined at the base, distinct from the ovary, with an imbricated æstivation. Petals four-five, alternate with the sepals, rarely none. Stamens four-five, alternate with the petals, with a doubtfully perigynous insertion; anthers two-celled. Ovary free, surrounded by a somewhat fleshy disk; two, three, four-celled; cells one or many seeded. Ovules erect, rarely pendulous. Style one, or wanting. stigma, two-four cleft. Pericarp a capsule, berry, durpe or samara, various in form, often deformed by the suppression of some of the cells. Seeds generally, especially in the capsular fruits, asillate. Albumen none or fleshy. Embryo straight.

A hardy, almost evergreen shrub, of low bushy growth. It has been long cultivated in this country, and is a native of North America, where it grows wild in hedges and shady woods, among rocks, and on the edge of swamps, from New England to Carolina.

It flowers in June and July. The fruit, as in the other species, is the most ornamental part. It will grow in any garden soil, and is increased by seeds or layers.

ERICA VARIA.

VARIABLE HEATH.

Octandria Monogynia.—LINN.

Ericeæ.—LINDLEY.

Calyx free, in five divisions, with four bracteas at the base. Corolla monadelphous, nearly regular, five parted, marcescent. Stamens definite hypogynous, alternate with segments of the corolla. Anthers collateral, slightly cohering. Ovary one celled, with a single erect ovule. Style single. Stigma enclosed in a two valved cup. Fruit a membraneous utricle, enclosed within the indurated tube of the calyx. Seed solitary, erect, without albumen. Embryo with plano-convex, fleshy cottledons, and a minute inferior radicle.

This was introduced about the year 1810, from the Cape of Good Hope, of which it is a native. It is a low, bushy kind, flowering at different seasons, but principally in the autumn. Like the other kinds, it must be preserved in an airy greenhouse. It will increase by cuttings, and should be potted in sandy peat soil.

RENANTHERA COCCINEA.

SCARLET FLOWERED RENANTHERA OR AIR-PLANT.

Gynandria Monandria.—LINN.

Orchideæ.—JUSS.

Stem often eight or ten feet in length, round, leafy, slightly branched, the lower part sheathed with the persistent bases of the leaves, pushing forth a few long, tortuous roots, by which it clings to trees or stones. Leaves fleshy, distichous, veinless, flat, obliquely emarginate at the apex, dark-green, sublucid, four-five inches long. Panicles lateral, loose, many-flowered, two feet and a half long, with hard round branches. Bracteæ short, ovate, somewhat shrivelled. Ovarium continuous with the short peduncle, pale red, with six furrows. Sepals spreading, distinct at the base, not imbricated, fleshy, the three *upper* linear, erect, the middle one being larger and spatulate, scarlet, banded with yellow cloudy spots; the two *lower* an inch and half in length, longer than the upper, hanging down, collateral, unguiculate, lanceolate, obtuse, abruptly undulated in the middle, scarlet, with a few obscure paler bands. Labellum dwarf, only three inches long, bagged, articulated with the column, three-lobed, the lateral lobes erect, truncate, yellow, bordered and striped with scarlet, the *middle* one tongue-shaped, reflexed, scarlet, yellow at the base; saccus conical, obtuse, yellow and smooth inside, scarlet and dotted outside, with the throat callous all round. Columna scarlet, half round, the length of the labellum apterous, striped with yellow in front, its anterior margin incurved over the stigma. Stigma hollowed out, roundish. Anther terminal, opercular, dark scarlet, obtuse, one-celled, half two-valved at back. Pollen masses two, reniform, two-lobed at back, with a triangular gland, and a diaphanous scarcely elastical caudicule, contracted in the middle.

The cause of previous want of success in inducing this plant to flower has resided in its having been cultivated in too dry an atmosphere. Mr. Fairhairn, gardener at Claremont, impressed with this opinion, tried the effect of tying moss around the stems, and keeping it constantly damp, exposed as much as possible to the influence of the sun, which was entirely successful.

To botanists it has been as little known as to the rest of the world, almost every systematist having omitted it. And yet the language of Laureiro is far from unsatisfactory, allowance being made for certain peculiarities of diction.

A native of the woods of Cochin China, where it climbs over trees. Propagated without difficulty by cuttings. When in flower, the plant may be safely removed to a dwelling apartment, where the blossoms, which are very durable, will remain in blossom many weeks.

CROTALARIA VERRUCOSA.

WARTED CROTALARIA.

Monadelphia Decandria.—LINN.

Leguminosæ.—JUSS.

Stem erect, succulent, branched, angular, nearly smooth, about two feet high. Leaves simple, ovate, apiculate, smooth, with pubescent petioles, either acute or obtuse; stipules half-ovate, lunate, reflexed. Racemes terminal, many-flowered, with the rachis, pedicels, and calyces pubescent, usually sterile at the top. Bracteæ very small, subulate. Corolla blue. Pod oblong, inflated, pilose.

A tender stove annual, native of many parts of the East Indies, and varying extremely in the size and form of its leaves, which are sometimes acute, as in the accompanying figure, sometimes retuse at the apex, and sometimes even hastate.

PENTSTEMON DIFFUSUM.

SPREADING PENTSTEMON.

Didynamia Angiospermia.—LINN.

Scrophularineæ.—JUSS.

Root perennial, creeping. Stems decumbent, rooting, branched, one and half to two feet high, round, smoothish, purple. Leaves evergreen, ovate-oblong, unequally serrated, smooth, deep green; the upper serrated, the lower decurrent on the petiole. Peduncles axillary, pubescent, generally shorter than the leaves, many-flowered at the apex. Bracteæ pubescent,

ovate-acuminate, entire. Calyx turbinate, pubescent; the segments spreading, finely lacerated at the edge, aristate at the point. Corolla purple, an inch long, smooth; the upper lip retuse, the lower trifid, with rounded segments. Fifth filament sterile, the length of the tube bearded. Capsule ovate, slightly pubescent.

A beautiful hardy perennial, with evergreen leaves, and decumbent, rooting stems, by which it is readily increased. Native of open grounds and banks of streams in the districts around the mouth of the Columbia River, where it was found abundantly by Mr. Douglas.

Grows freely either in common light garden soil or in the American borders, in both which situations it flowers in the utmost profusion from June till its growth is arrested by frost.

SINNINGIA VILLOSA.

SHAGGY SINNINGIA.

Didynamia Angiospermia.—LINN.

Gesnereæ.—JUSS.

Stem round, thick, fleshy, simple, two feet high, pale green, villous. Leaves on long petioles, oblong-lanceolate, crenate, convex, villous, appearing as if strigose, pale green. Flowers aggregate in the axillæ of the leaves, than which they are much shorter, on short peduncles. Calyx obovate, villous, the length of the winged ovarium much shorter than the corolla. Corolla externally villous, pale green, not dotted, about two inches long.

This is a fine stove plant, flowering abundantly during all the summer, and growing freely in peat and loam. It requires a high temperature, and much atmospheric moisture, to succeed perfectly.

A native of Brazil, whence roots were sent in 1826 to the Horticultural Society by Henry Chamberlayne, esq. It is increased with much difficulty by cuttings or by leaves.

PRUNUS CANDICANS.

SNOWY PLUM.

Icosandria Monogynia.—LINN.

Amygdalaceæ.—D. C.

Leaves soft, oblong, simply serrated beneath, and on the petioles, which are pale, pubescent. Flowers white, very numerous, heaped in many-flowered fascicles, so as to cover the bearing branches. Pedicels and calyces pubescent; tube of the calyx short, spreading, segments ovate, downy inside. Petals oblong, unguiculate. Fruit unknown.

A fine hardy shrub, apparently not exceeding five or six feet in height. Its native country is unknown. It was first published by Mr. Balbis, in his Catalogue of the Turin Garden, in 1813; and in the same year its name appears in Schlechtendal's Supplement to Willdenow's Enumeration of the Berlin Garden. We believe that the date of its introduction to this country is 1825, in which year plants were received from Messrs. Baumanns, nurserymen at Bollwiller, in Germany, by the Horticultural Society.

This plant is quite hardy, easily cultivated, and in the spring is so laden with white blossoms as to seem a mass of snow amidst the green leaves and rosy flowers of the season. From this circumstance its name has undoubtedly been taken, and not from any peculiar whiteness of its leaves, as Mr. Seringe appears to suppose; the under side of the leaves is not, indeed, unusually white.

CASTILLEJA COCCINEA.

VERMILION-LEAVED CASTILLEJA.

Didynamia Angiospermia.—LINN.

Scrophularineæ.—JUSS.

Stem annual, decumbent, striated, covered with long hairs. Leaves oblong, trifid at the end, or entire, covered with long hairs, with three nerves; the lowest often entire. Bracteæ oblong, pinnatifid, scarlet, yellow, or white. Calyx tubular, with a dilated limb and retuse segments. Corolla green, pubescent; its tube shorter than the calyx. Capsule roundish, oblong. Seeds cuneate, reticulated.

A pretty hardy annual, native of gravelly soils in various parts of North America. It is very abundant in upland meadows about the river Columbia, where it was found by Mr. Douglas. Seeds were sent by him to the Horticultural Society in 1826, and plants produced by them flower in the open border.

Increased by seeds, which are produced in small quantities. Should be grown in gravel or peat, and sand, and not in loamy soil.

The plant as represented in the accompanying plate varies materially from its wild state, in having its lower leaves entire and not trifid; but in other respects it agrees with the spontaneous specimens. The vermilion colouring of the bracteæ is very beautiful; sometimes it varies to a lively yellow, and even to white.

PENTSTEMON PULCHELLUM.

PRETTY PENTSTEMON.

Didynamia Angiospermia.—LINN.

Scrophularineæ.—JUSS.

Stem erect, branched, a foot and half high, slightly pubescent. Leaves linear-oblong, serrulate, smooth, the uppermost sessile, and somewhat amplexicaul. Panicles terminal, simple, rather one-sided, with two-flowered peduncles, longer than the bracteæ. Sepals pubescent, somewhat glandular. Corolla violet or lilac, pubescent, without glands, ventricose, with white veins; segments nearly equal; palate spotted, villous. Stamens smooth, the uppermost the length of the tube, and somewhat exserted; sterile filament the same length as these, bearded at the end.

A handsome, half-hardy perennial, a native of Mexico, whence seeds were brought in 1826 to Mr. Tate, of Chelsea. It thrives exceedingly well if planted in a warm border exposed to the south.

This species is very near pentstemon, campanulatum, from which it differs principally in its corolla being paler, more inflated, and destitute of glands, which abound on the corolla of penstemon campanulatum. The leaves of this plant are also less finely toothed, not so acuminate, and of a more oblong figure.

LUPINUS LAXIFLORUS.

LOOSE-FLOWERED LUPINE.

Monadelphia Decandria.—LINN.

Leguminosæ.—JUSS.

Stems tufted, slender, pilose, purplish, 1-1½ foot long. Cauline leaves densely pilose; stipulæ subulate, very small; leaflets 7-9, linear-lanceolate. Racemes lax, stalked; bracteæ subulate, the length of the pedicels, deciduous, very pilose. Calyxes somewhat alternate, densely pilose, without bracteolæ; the upper lip short, ovate, entire, with a sort of bag at its base; the lower ovate, acuminate. Vexillum blue, obcordate, with the keel, which is beardless, and the wings pale rose-colour.

A small, slender, perennial species, found by Mr. Douglas in dry, open, gravelly plains, about the great rapids of the River Columbia, where it is very common, forming patches of considerable extent, occasionally acquiring a suffruticose habit.

The flowers are blue, mixed with pink, and, although not equal in appearance to some of the larger species, extremely beautiful: they appear in August and September.

Grows readily in common garden soil: it has not yet produced seeds, but will increase by division of the root.

9. Smmingia villosa

10 Renanthera coccinea

11 Banhinia cumanensis

12 Pentstemon diffusum

3. Clivia nobilis.

1 Billbergia pyramidalis.

Cratægus Cordata.

Tulipa Oculus Solis; Var Persica.

5. Sophora velutina

6. Gaillardia aristata.

7. Paeonia hybrida.

8. Hemelia ventricosa.

THE IMPORTANCE OF AGRICULTURE.

FREDERICK the Great, king of Prussia, was one of the most enlightened improvers of the internal state of a country, that ever existed. In that important branch of policy, he principally followed the advice of the celebrated Hertzberg, from whose memoirs the following particulars are extracted :—

"The prosperity, the happiness, and the resources of a great nation, consist indispensably in the multiplicity, the quantity, and the good quality of those means by which such nation can procure, in the first instance, the necessaries, and afterwards, the conveniences of life.

"As corn and all kinds of grain furnish certain food and subsistence to numerous inhabitants (fisheries only supplying small districts), *Agriculture* is incontestibly the source and positive basis of subsistence for a great and populous country; since it furnishes grain of every kind for the support of man and beast, as well as wine, beer, oil, timber, &c.

"Agriculture also furnishes flax, hemp, wool, silk, and every thing necessary for the raiment and other comforts of life; and all the principal ingredients for manufacture, navigation, and commerce. By these means, and the barter of its surplus, it acquires gold and silver; which last, though without intrinsic value, have been received amongst all civilised nations, as the sign and representation of wealth.

"Agriculture not only maintains the labourer and the husbandman, but likewise every other class of individuals, not engaged therein, but employed in any other calling or profession whether civil or military.

"Agriculture is then the grand staple and basis of prosperity in all states; and this principle has prevailed to such a degree for some time in France, that a set of ingenious agriculturists, to whom the lofty title of economists or physiocrates, has been given, more conversant, perhaps, in theory than in practice, have made every effort in their power to obtain for agriculture, the chief and sole favour of government, particularly by a free exportation of corn, yet laying on agriculture, almost exclusively the burthen of taxes. The impropriety of this principle was soon discovered on more mature reflection; for a wise government, though it gives equal attention to *national industry*, will not exempt it generally from national burthens. This is doubtless the second basis of the prosperity of states, since it gives the utmost value to the natural productions of a country, as well as the labour and ingenuity of individuals, with a considerable greater profit to those thus employed, than what is got by labourers who till the land. It is such labour, as Smith has admirably proved, which constitutes the true criterion, and univeral estimation, of all merchandize and riches; and money is only the token; for all productions, artificial and natural, are the result of the labour of individuals, to support themselves, and dispose of their surplus. The result of which is, that the labour of individuals and national industry, which form the second basis of national prosperity, may, on certain occasions, supply the place of agriculture. Thus, the French, with an inconsiderable portion of agriculture, have, for above a century, rendered all the nations of Europe tributary to their ingenuity, invention, and labour, in mechanic arts. Have not the Dutch with a miserable barren soil, yielding a small portion of what is wanting for themselves, carried on an universal trade and navigation throughout Europe, and availing themselves of the indolence of their neighbours, furnished them with their wants, even such as the Dutch themselves did not possess? Have not the Spaniards, with all their silver, been at times in want of bread? Thus, Poland, a fruitful country, abounding in corn, the result of agriculture, for want of national industry, is bereft of many other conveniences of life. All these premises leave not the least doubt on the general principle, that the primary basis, and prosperity of a state, and its most certain riches, consist in a well directed agriculture, and abundance of natural productions; and the second basis depends upon national industry, giving by labour a value to natural productions, and, by ingenuity and application, a still greater value to manual arts and manufactures.

"Impressed with such ideas as these, the sovereigns of Prussia granted large sums for the cultivation of wastes, draining of bogs, the embanking of rivers, and other objects of internal improvement. Frederick the Great, in particular, distinguished himself in this way. He also rendered important service to agriculture, by authorizing and encouraging the abolition of commons, and separating arable land from pasturage, by which an individual proprietor may reap much greater advantage, than if he held such right in common with others."

We propose following up these views of the importance of agriculture, by giving in a series of papers an account of the various branches of husbandry pursued in Great Britain and Ireland, with such suggestions as may arise as to the capability of farther improvements which the United Kingdoms present.

PARMESAN CHEESE.

THE following account of the method of preparing cheese in the Lodecan, commonly called Parmesan cheese, is taken from the Journal de Physique.

The size of these cheeses varies from sixty to one hundred and eighty pounds, depending considerably on the number of cows of each dairy. During the heat of summer, cheese is made every day, but in cooler months milk will keep longer, and cheese is made every other day. The summer cheese, which, is the best, is made of the evening milk, after having been skimmed in the morning and at noon; mixed with the morning milk after having been skimmed at noon. Both kinds of milk are poured together into a copper caldron, capable of holding about 130 gallons, of the shape of an inverted bell, and suspended on the arm of a lever, so as to be moved off and on the fire at pleasure. In this caldron, the milk is gradually heated to the temperature of about 120 degrees; it is now removed from the fire, and kept quiet for five or six minutes. When all internal motion has ceased, the rennet is added. This substance is composed of the stomach of a calf, fermented together with wheaten meal and salt; and the method of using it is, to tie a piece of the size of a hazel nut, in a rag, and steep it in the milk, squeezing it from time to time. After a short space, a sufficient quantity of rennet passes through the rag into the milk, which is now to be well stirred, and afterwards left at rest to coagulate.

In about an hour the coagulation is complete; and then the milk is again put over the fire, and raised to a temperature of about 145 degrees. During all this time it is heating, the mass is briskly agitated, till the curd separates in small lumps; part of the whey is then taken out, and a few pinches of saffron are added to the remainder, in order to colour it. When the curd is thus broken sufficiently small, nearly the whole of the whey is taken out, and two pails full of cold water are poured in. The temperature is thus lowered so as to enable the dairy-man to collect the curd, by passing a cloth beneath it, and gathering it up at the corners. The curd is now pressed into a frame of wood, like a bushel without a bottom, placed on a solid table, and covered by a round piece of wood with a great stone at the top. In the course of the night it cools, assumes a firm consistence, and parts with the whey; the next day one side is rubbed with salt, and the succeeding day the cheese is turned, and the other side is rubbed in the same manner. This alternate salting on each side is practised for about forty days. After this period the outer crust of the cheese is pared off; the fresh surface is varnished with linseed oil: the convex side is coloured red, and the cheese is fit for sale.

OF STACKING HAY.

The mode in which hay is stacked in the vicinity of London deserves to be more generally known than it is, and particularly, should the enterprising agriculturists in the north attend to it, where the hay is by no means so carefully or judiciously managed. In the neighbourhood of London, the crop is cut when very green, before the blade is hardened, or the sap nearly exhausted; thus, in the first place, saving the land from farther exhaustion, and increasing the value of the produce. As soon as cut, it is put into small cocks, and stacked with due speed. But it is the manner in which the hay is stacked we at present particularly refer to. Two large posts are perpendicularly erected at a distance from each other, equal to the length of the intended stack; a cross beam is laid, stretching from one post to the other, upon which a large piece of canvass is hung, intended as a covering to the stack during the time of building; and the hay is brought in small quantities, according to the state of the weather, or the degree of drying it has received. By this means whenever any portion is got into condition for keeping, it is instantly secured, whilst the stack is kept from injury by the sort of umbrella that covers it. Thus also is the whole mass allowed to settle down gradually, which tends to keep it from over-sweating, a thing highly injurious to natural grasses. In such a variable climate as that of this island, this method of preparing and preserving hay should be extensively practised.

OF HAY TEA.

When speaking of hay, it may not be out of place to give a receipt for the making of hay tea, which is a good and cheap substitute for milk to feed calves, as has been found in the north of England. Take a large handful, or about one pound of red clover hay, well got in and preserved, and boil it in six quarts of clear spring water, until it is reduced to four quarts. Then take out the hay, and mix one pound of barley, oat, or bean meal amongst a little water; put this into the pot whilst it is boiling; keep the whole continually stirring until it is boiled and thickened. Let it cool to be lukewarm, then give it to the calves, adding as much whey as will make a sufficient meal.

EXPERIMENTS AND OBSERVATIONS ON FLOUR AND BREAD.

The following judicious experiments and observations on flour and bread were delivered by Dr. Iriving to the Committee of the House of Commons, appointed in 1774 to consider of the methods practised in making flour from wheat, &c., which we think are worthy of being known at any time.

"To grind wheat into flour with the greatest advantage, the millstone should make about sixty revolutions in a minute; if faster, the stones acquire too much heat, and give a burnt taste to the meal; if slower, a part of it adheres firmly to the bran or husk, and cannot be separated in the bolting.

"Flour, when kept some time, evaporates a part of its moisture, becomes less adhesive and clammy, loses somewhat of its agreeable taste, and imbibes a greater portion of water in the making of it into dough: the bread of it appears smoother in the cutting, whiter in the grain, dries sooner, and becomes more crumbly, than the bread of new flour. These reasons induce the baker to prefer old flour to new in the making of bread.

"The yeast of porter does not raise bread so perfectly as that produced from small beer; besides, it is bitter to the taste; the baker, therefore, in London, instead of using a sufficient quantity of yeast for the leavening of his bread, mixes only a small portion of it with flour and water, made to the consistence of a syrup, called *spunge*, which, when fermented, is added to the flour; and, being worked up together into dough, the whole mass is suffered to ferment.

"This method, however, of leavening the dough, is by no means so good as that in which yeast only is used; as it gives the bread a sour taste, frequently perceptible in that of London. I find by experiment, three pounds and a half of flour, kept a year in a dry place, requires two pounds of water to make it into dough, and loses in the baking into bread, ten ounces; but from the variable age, dryness and quality of the flour, with the indeterminate degrees of kneading and baking, it is impossible to ascertain the exact proportion of water in all cases; nor is any uniform proportion ever observed by the bakers.

"Flour made from heated or damaged corn does not thoroughly mix with water, so as to form a perfect dough, unless a small portion of alum be added. In this case, the baker is induced to use it; as he may be likewise, when the water with which he makes the dough is very muddy: alum having the property of purifying it. I find, however, by the experiment of dissolving the salt from bread by water, and adding to the solution an alcali (which would discover the earth of alum by precipitation) that the bakers in London very seldom use alum, but substitute hard pump water, with an extraordinary quantity of common salt; which, in some measure, answers their purpose in the working of damaged flour.

"Flour or bread, freed of its salt, being burnt in a crucible, leaves behind only a very small portion of earth; but if chalk, lime, whitening, bone ash, or any calcareous substance, be mixed with either, these foreign ingredients will remain unconsumed in the crucible, and the quantity may be perfectly ascertained.

"The mixture of these ingredients with flour or bread may also be discovered, by adding spirit of salt well diluted with water; and their quantity known by precipitation with a fixed alcali. The following experiments were made with a view of ascertaining these facts.

"*First.* One pound of fine flour, burnt in a crucible, left behind twenty-eight grains of earth; of which nineteen were sandy matter; the remainder soluble in an acid.

"*Secondly.* One pound of bread of a quartern loaf, freed of its salt by water, and treated in the same manner, gave forty-three grains, of which twenty-nine were sandy matter; the rest soluble by an acid.

"*Thirdly.* One pound of bread added to spirit of salt, sufficiently diluted with distilled water, gave scarce any precipitation of earth by adding a fixed alcali.

"From these and other chemical trials, several times repeated with flour and bread procured in many parts of London and Westminster, the result was nearly the same, except that coarse flour and bread contained a few grains more of earthy matter. It evidently appears, therefore, that no frauds were practised in the above samples.

"The defects of the London bread seem to be owing to the following causes:—1st. The use of old flour, in preference to new, which gives the bread a less savoury taste. 2nd. The employing *spunge*, instead of yeast; which generally gives a sour, unpalatable taste to the bread; and, 3rd. Not kneading it sufficiently, but, in place of that labour, using too great a quantity of water, which makes the bread heavy and unpleasant."

THE AGRICULTURE OF ABERDEENSHIRE.

We propose to give a series of papers on the various branches of rural economy; and for this purpose shall fix upon some particular county in the United Kingdoms, as the text for particular subjects. In a former number the Dairy Husbandry of Ayrshire and the western counties of Scotland have been shortly described; we now proceed to the prominent feature in the agriculture of Aberdeenshire, availing ourselves of the

excellent report of that county, drawn up by Dr. Skene Keith. Gardeners, cottagers, possessing small allotments of land, and farmers of all descriptions, cannot but be struck and benefited by the reverend gentleman's information, which we now abridge.

Necessity first drove the proprietors and small farmers of Aberdeenshire to cultivate their lands in a manner to afford a lesson to many others, viz., by a mixture of the plough and spade husbandry. From the peculiar situation of the cities of New and Old Aberdeen, on a small neck of land between the rivers Dee and Don, near their entrance into the sea, it became necessary to cultivate all the ground in their neighbourhood. Grass for the cow-feeders, garden-roots, and other articles of provision, which could not be brought from the neighbouring territory, were much wanted. As the population amounted to many thousands, and was rapidly advancing, the matter became more urgent. To improve the old lands, therefore, and to trench with the spade and mattock a considerable quantity of very rough soil, extending about three miles from Aberdeen, were the steps taken to accomplish the necessary object. In the course of forty years, at least three thousand acres in that vicinity were brought into cultivation. The ground had been either covered with heath and filled with stones almost to the surface, or interspersed with patches of grass and large masses of granite lying above ground. The expense of bringing into a good state such land was immense, and probably never incurred in any other part of the island to the same extent and in similar circumstances; nor could it have been borne if the first crop had not produced from 30*l.* to 50*l.* per acre; this crop was granite stones, which was sold for paving the streets of London.

After all, the ground thus gained to the community would not have recompensed the cultivator if a mixture of the spade and plough husbandry had not been introduced. It would have yielded too little if tilled only by the plough, and the outlay would have been too great if the soil had been constantly digged by the spade. A medium process therefore was adopted, which answered admirably; and which in the neighbourhood of all large towns should be adopted, unless the nature of the ground forbid it. Gardeners and cow-feeders, who pay high rents, are by this means enabled to raise two crops in one year, or three crops in two years. Their rotations of cropping are very quick; yet one year of clover cut for soiling, or made into hay, and the pasturing of this grass next year till after midsummer, and their breaking it up for turnips, keeps the thin land near Aberdeen in good condition, and tends to give more tenacity to the soil, which is naturally light and of a loose texture.

Trenching is practiced in barren land, which abounds in stones of different dimensions, used for this purpose, it is the most complete method of rendering such land arable. In this case the surface is cut into square or oblong pieces, and thrown in the bottom of the trench, excepting when forming the first trench, which of necessity is thrown on the barren or unbroken land. The labourer cuts off a breadth generally of three feet, and throws out both soil and subsoil to the depth of about fifteen inches, and as long as he finds it expedient. He throws all the stones on the surface, and generally requires two *spadings* and two *shovelings*, to fill up his trench. The first *spading* is about eight inches deep, if he be able to pierce so far into the ground—this is thrown into the open trench: then with a shovel he throws the loosened earth, left by the spade, above the *spading*; after which he digs a second time, and what is now raised is laid also above what was formerly dug, using the shovel to level the bottom; and thus, if the new trench be deep enough, he is prepared to shape off another course, to be dug and thrown in the same manner.

But it often happens that the spade cannot pierce stony ground. In this case a kind of mattock, provincially termed a *pick*, is applied, and this till the requisite depth be gained. Where the mattock is too weak to lift the stones levers are used; and if these be insufficient, they are blown by gunpowder.

When the ground is wet, the labourer shews particular accuracy and dexterity in laying the bottom of the trench. The grassy surface is most carefully laid on its back, and every sod compactly joined together, that the water may form a new *pan* or channel between the soil and subsoil. The bottom of the trench is cleared of all loose earth and formed into a slope, with a small descent if possible for the water, before the surface is inverted or compactly laid. It is the care used in scouring the bottom of the trench, laying the inverted surface, and properly joining the sods, that renders the trenching so useful in wet lands.

If draining be necessary as well as trenching, the drains are cut as much deeper than the bottom of the trench, as that the whole water contained in the drain shall be below the level of the bottom of the trench. Only a small part of the bottom of the trench is made to slope gently into the drain, that no water may remain among the grassy sods.

When the object is merely to deepen the soil, the ground in the subsoil is chiefly loosened by the mattock. But in this case it is necessary that the bottom of the trench be completely *picked* up, and that no interstices of hard subsoil be left between the trenches. The labourer must also *clean the teeth* of the trench, so as to prevent any space being left unloosened by the spade; otherwise the breaking of the plough, that comes in contact with the ridge that was improperly left, is not the only evil attendant on what unskilfulness or dishonesty left unloosened.

It often happens that the soil and subsoil are of different qualities; trenching mixes them, and produces a better soil than either. The surface no doubt is turned into the bottom; but by using the shovel twice, the two are considerably mixed; whilst in the course of two ploughings the thing desired is completed. Trenching is also practised with great success when the subsoil is tilly and very tenacious. When the moory soil is thrown into the subsoil of a trench, and a mixture of moor with the till in the bottom is laid on the top, the superabundant moisture is carried off, and the land becomes very productive.

Cropped land, especially when injured by getting too much lime, is completely renovated by trenching; and either dung or lime can be applied to the greatest advantage. Where additional depth can be obtained by the plough, as in deep soils, trenching is not necessary, even after once cropping. But where the soil is different, and when by piercing the *pan* new soil is brought up, dung and lime are always applied with success. Trenching, to mention one other benefit resulting from it, is of the utmost service in foul land, or when either stronger or cleaner soil can be brought to the surface. This can always be done with the spade when the common plough would be useless, and when the trench-plough could act very imperfectly.

Such is the manner in which the effective process of trenching has been carried on in Aberdeenshire, to the vast improvement of the county, within these last seventy years; furnishing a highly important lesson to all who would improve or renovate their lands.

ON THE FOOD, FIRING, CLOTHING, DWELLINGS, GARDENS, AND COTTAGE FARMS OF THE LABOURING CLASSES.

In our last number we gave the plans and the description of several cottages, well worthy the attention of all who would delight to see the condition of the labouring classes bettered. The neatness, convenience, comfort, and cheapness of these little dwellings must strike the mind of every one who glances at them for the shortest period. Every thing tending to the welfare of this interesting and most necessary portion of the community has at all times been an important consideration in the eyes of philanthropists; but never certainly has the public

mind been so completely and earnestly engrossed with the subject as of late. The depressed state of the country, the scarcity of employment, or the inadequacy of wages, are not the only causes for this extraordinary degree of general excitement. The Poor's Law Bill has brought the most momentous matters connected with the lower orders to be discussed, whilst the marvellous revolutions that have occurred, or are taking place, in every department of social life and sentiments, unite to lend to whatever concerns their dearest interests on earth an immense value and weight.

The matters named at the head of this paper embrace every thing, excepting education or morals, that is necessary to human *happiness*, so far as its blessings are to be commanded in this world, In the careful, earnest, and benevolent discussion which we now enter upon concerning the domestic economy of the labouring classes, we shall be led to point out the various states and fashions of those things particularly named, as they are to be found in different parts of the empire, and sometimes as they are to be seen in other countries. For we have long lamented, that out of the thousands of British travellers that have treated the public with what they have discovered in other regions, not one of them ever seems to have thought it worth his while to devote his time and his talents to the observation of the domestic economy of the most useful orders that is to be found in any community. What a field for investigation ; and how plentiful harvest would of knowledge, the real, active, practical, and living knowledge, be! This discussion will naturally enable us or others to suggest further improvements from the lights we fall in with. The public at large have no conception how little one portion of our countrymen know of the plainest and most necessary domestic operations of another. Were there nothing more done by us in this attempt than to shew the people in the north what is an every day *thing* in the south, or, rather, were the inhabitants of the south to be told what is constantly practised in the north, we venture to predict that an amount of real benefit would instantly result from this reciprocity of information that would far outweigh the good which any one direct act of legislation has for a long time accomplished. For it would lead the people themselves to work out their own well-being, in which voluntary endeavours, the blessings conveyed in the thing obtained are not probably so great as the habits which accompany the cheerfulness and alacrity of the performances. Much railing has been afloat regarding the English poor laws. Our taste and present object lay not in this way ; for we are sure, that were the lower orders themselves earnestly to set about their own regeneration, the consequences would be much more delightful than those that can possibly arise from stern legislation. Did they themselves know the best practical modes of reducing their expences, without diminishing their comforts ; did they know the way by which to prepare cheap and pleasant substitutes for those articles which in times of scarcity and distress exhaust so much of their daily earnings, doubtless advantage would be taken to a remarkable extent of such information. There are many mechanical contrivances which may with little expence be applied to render the cottager's habitation much more comfortable than generally is to be found.

The labourer has many difficulties to struggle against. His wages are often too small, and he is as often obliged to purchase the articles he must have in such petty portions as to be at a great disadvantage compared with more opulent persons. But above and beyond all this, ignorance, custom, or prejudice lead him to adhere to improvident systems of dress, diet, and other branches of private expenditure, which are much more generally disastrous than any other cause external to himself. To convince an employer that he gives inadequate wages is not an easy task ; but to make the wages received go a great deal farther than they generally are allowed to go, depends on a few simple arrangements at home. Alas! how many instances there are where no economy can shield the virtuous poor. Still there are as many in the deepest wretchedness of penury from wasteful habits ; and did our earnestness affect only this portion, the result would be glorious. It has been an assertained fact, that the greatest portion of inmates in the poor houses, have been persons in the receipt of the best wages. We by no means wish to enforce a cold-hearted doctrine, however, but one tender, beneficient, and encouraging. It is this, that the labourer's income may be spent in a far more advantageous manner to himself than it usually is ; and with equal profit, too, to those who subsist by the demand for consumable commodities ; for a decrease in the demand for such would be a blow to the national good ; a thirst for superfluities is even of great public benefit. But we are anxious that the labourer should know what is the surest method of commanding such commodities, nay, such superfluities, in health, sickness, and old age. The humble labourer, still more the pauper, is an object of the deepest concern to every well-regulated mind. He who has been reduced by unavoidable misfortune should claim equal observance in the eye of a brother with him who has raised himself by extraordinary efforts from humility to dignity, we mean, as an object of wonder ; whilst, as an object of sympathy, it argues sorely against human nature that the contemplator does not make himself great, through the opportunity offered for elevating his depressed brother. But what shall we say to the improvident poor, to the wretched profligate ? This is the class that above all others claims a nation's heart. What is the woful state even of him who has been reduced by misfortunes, against which he was unable to stand, compared to that one who has with a suicidal hand destroyed his own earthly welfare ? that one who is wretched here, and whose prospects hereafter offer no alleviation or recompense ? It should be a nation's pride and labour, it should be the leading object in every man's eye, to reclaim, regenerate, and save this array of mankind. Pity it is that any should never, either in time or throughout eternity, have tasted pleasure or comfort! Be it our endeavour therefore on this occasion to hold up in a plain and tangible shape some good things within the reach of very many such of our most destitute and degraded brethren. Numbers are so besotted and wedded to vice or prejudices, that they turn from the benefits offered. But let us implore for those the attention at least of their employers ; the persevering and generous good offices of every sound-thinking man. We think the contents of the following pages may in some degree tend to direct a philanthrophic enquirer in this matter :—

Diet leads us at once to make a remarkable comparison to the habits of the labouring classes of these islands. There is not only a great difference in the proportion of earnings appropriated to the purchase of subsistence by labourers in the north and south of Great Britain, but in the mode of preparing it ; the dissimilarity is matter of wonder to us. In the south of England the *poorest* labourers are habituated to the unvarying meal of dry bread and cheese from weeks' end to weeks' end ; and in those families, whose finances do not allow them indulgence of malt liquor, the deleterious produce of China constitutes their usual beverage. If a labourer is rich enough to afford himself meat once a week, he commonly adopts the simplest of all culinary preparations, that of roasting it ; or, if he lives near a baker's, of baking it ; and if he boils his meat, he never thinks of forming it into soup, that is not only as nutritive, but certainly more palatable than a plain boiled joint.

In the north, on the contrary, the *poorest* labourers regale themselves with a variety of dishes, wholly unknown in the south, and at a cheaper and more wholesome rate. We shall give an intelligible description of the processes there followed out in their culinary duties. The *hasty pudding* is one of the simplest articles. This is what Burns calls "the healsome porritch, chief of Scotia's food." It is made of oatmeal, water or whey, and salt in the following manner: To a quart of water, whilst it is boiling in an open pot, a small quantity of salt is added, and of oat-meal, about 13 ounces are dropped into it by little and little whilst boiling, and kept stirring by a stick,

called a *spurtle*. The whole is boiled for several minutes till it becomes of a proper consistence. This quantity is sufficient for a meal for two labourers, and it is eaten with milk, butter, beer, or treacle; the best liquid, however, is butter or churned milk, which, as prepared in Scotland, is delicious. See a paper in our last number on the Ayreshire Dairy System. This is an extremely nutritious dish, and highly relished by those who have become accustomed to it. A good meal for one person, supposing the price of oats to be twenty shillings per quarter, will not exceed a penny. But a little bread and cheese generally follows the mess.

Crowdie or *brose* is a dish the most easily made ready, though not so common as the former. The process is simply pouring boiling water over dry oatmeal, and stirring it a little; milk or butter is then added, and the matter is complete. *Fat brose* is a luxury; this consists of boiling broth being poured on oatmeal, instead of water, and the meat from the broth is eaten along with it. When they boil corned beef, which is generally done on Sunday, this supplies enviable stores of savoury skimmings for crowdies. This last dish is most in use in the north of England.

Frumenty or *barley-milk*, is barley boiled for about two hours in water. Milk is then added, and sometimes a little sugar. But for hot weather, here comes the lightest and most cooling food in the world perhaps; it is called *sowens*, a kind of flummery. It is thus made: When the oats are ground at the mill, the husks or *seeds* as they are named, gathered in sifting the meal, are as occasion requires put into water, where they remain for about two days; they are then wrung or strained out again; and this process is repeated a second and third time in different vessels of water. By this process all the small mealy particles that were attached to the *seeds* are extracted. The waters are then mixed together, and when the whole has stood about six hours, the clear water is poured off, and fresh water is added. When the sediment which is thus obtained is to be used, it must be stirred up, and water put to it till it will just tinge a wooden dish with a whitish colour. It is then put into a pot and boiled for nearly an hour, care being taken to stir it all the time; and it is said that the mess must always be stirred one way. When poured into basons, it soon acquires a considerable degree of solidity, and becomes, if sufficiently boiled, perfectly smooth, like what is blanc-mange. It is eaten with milk; it has a deliciously simple taste, conveying the idea of the utmost purity. But though cheap, it is by no means a very nutritive dish. It suits admirably for supper, for which in warm weather it is generally used, being, if allowed to stand to cool in the coolest part of the house, as gratifying as iced cream.

Potatoes every where now is an indispensable article of food. But in the north they are cooked in several ways unknown in the south. We go on to mention one or two of these processes. A principal dish is of potatoes peeled or scraped when raw, chopped and boiled along with a small quantity of meat cut into very little pieces, or of bones that have been pretty well bared; pepper, salt, onions, &c. are added. This is a cheap and nutritive article, as the *lobscouse* of sailors may intimate to many persons who have never visited the north of Great Britain. In Scotland there is, during winter, very commonly a mess of *rumble-de-thump*. This is a potful of potatoes that, after having been pecled, are carefully boiled. The potful is then beat with a round and broad-ended staff to a perfect mass of meal; which, as good dry potatoes are sought after, is beautiful and white. Milk is then gradually added, whilst the whole is kept stirring by means of a *spurtle*, till it comes to a proper degree of thinness. Butter and pepper are also added where they can be afforded; and onions sometimes, which have been beat along with the potatoes. The whole presents a dish which a high authority has said is fit for a prince.

What will some people say, when it is told, that seldom in London are plain potatoes to be found well or perfectly boiled? But let us hear what Count Rumford has advanced in reference to directions of the Board of Agriculture on this point. In London, he says, the proper mode of preparing potatoes as food is little attended to; whereas in Ireland and Lancashire it is brought to very great perfection; where they are frequently ate as bread. The potatoes should be as much as possible of the same size, and the large and small ones boiled separately. They must be put into a pot with cold water, not sufficient to cover them, well washed, but neither pared nor scraped. (We would here add to the Count's statement, that the practice of salesmen having the potatoes washed, it may be for hours, or even days, previous to being boiled, is highly injurious to the flavour of the root, and is a thing we never saw in the north). If the potatoes are tolerably large, it will be necessary, as soon as they begin to boil, to throw in some cold water, and occasionally to repeat it till they are boiled to the heart. They will otherwise crack on the outside before they are thoroughly cooked. Salt occasionally thrown in is a great improvement; but the slower they are boiled, the better. When boiled, and the water is poured off, evaporate the moisture by replacing the pot once more over the fire. They should be brought to the table with the skins on, and ate with a little salt, if used as bread. Nothing but experience can satisfy any one how superior the potatoe is, thus prepared, if the sort is good and mealy. Boiling, he continues, is better than steaming, as it discharges a certain substance, which the steam alone is incapable of doing. With fish, butter, milk, even sour milk, an excellent mess is thus obtained. Yes, with nothing better than butter-milk (not the nauseous stuff which is to be generally found in English dairies), the potatoe is uncommonly nutritious, and strongly conducive to aid the prolific nature of mankind, as is proved in the case of the peasantry of Ireland, who subsist almost entirely on such food. As Sir F. M. Eden asks, from whose work on the state of the poor we have largely drawn. Where have we more numerous hordes of ruddy, healthy, and strong children, than may be seen daily issuing from the cabins of the Irish poor? Potatoes are a strong instance of the extension of the means of human enjoyment in modern times over the ancient. The price of wheat no doubt, in comparison with the money price of labour, has lately considerably increased. But many articles of food and clothing can now be obtained by poor cottagers, which the rich in much earlier years could not command; and the root of which we are speaking seems the most remarkable. It is in truth, now-a-days, "the poor man's wants, the rich man's luxury." Potatoes can be turned to many uses which we cannot tarry to notice. We can here only farther say of them, that in the north, mixed with oatmeal, or the flour of wheat, barley, or rye, they are very frequently turned into cakes.

Scotch broth.—It is not necessary particularly to describe this soup, as the process by which the dish is made is generally well enough known. The principal thing regarding it, for our present purpose, is to say, that since it is a wholesome delicious and cheap mess, particularly where there are many children, it is to be lamented that it should be comparatively so rare in England. Its rarity, however, must be chiefly owing to the extravagant way the Southrons go to work in providing the ingredients. Meat with them is the principal point, whereas, we should say, vegetables are the most important in the north. Beef, mutton, bacon, and these salt as well as fresh, are devoted to the broth-pot; a small piece of either is sufficient for a large quantity of vegetables, scarcely any species of which, that is to be found in a kitchen-garden, is thought unsuitable. In the south, the Scotch allotment of meat, in broth-making, is laughed at. But a due regard to the most wholesome and enlightened style of feeding man will call for abundance of vegetable diet, as well as of butcher's meat. We think it would be easy to show on which side the *grossest* error lies. At any rate the broth-eaters seem to be as brawny and as long-lived as the beef-eaters. Whilst the poor north-country labourers can manage to rear a pig, or save as much as will purchase

now and then a small piece of meat, he will have his hot and abundant mess at a comparatively small expence. Nor is it to be overlooked, that potatoes, or abundance of other vegetables, made into broth, always present an appearance of abundance on the table, which no moderate expenditure in meat can ever accomplish: a point of itself of extensive bearings.

Bread, the staff of life, claims our consideration. The great features connected with this subject to be observed in the north, are the various kinds of grain used for the production of bread, especially that of oats; and the making of it, being a domestic occupation. In Cumberland, bread is generally made of barley. After the usual process of turning the meal into dough, with salt, &c., it is baked in unleavened cakes, about half an inch thick and twelve inches in diameter; but is more commonly leavened, and made into loaves of about twelve pounds each. These loaves are usually baked in ovens heated with heath, furze, or brushwood. A common oven will bake about three Winchester bushels of barley made into bread at once. This bread will keep good for four or five weeks in winter, and two or three in summer. It is considered an extremely nutritious article.

Oaten cakes prevail all over the west of Scotland. They are made generally only with water; the dough, being kneaded well, and rolled out into a thin, broad, and round form, which is then cut into *fardels* or cakes, is placed upon a *girdle* or gridiron to be hardened. The hardening, however, is best completed by afterwards putting the cake in front of a clear hot fire. These cakes keep sound for months; but are for a short time *fired* again, after having lain long. The whole process of baking and hardening them seems extremely simple; still, like many a simple process, the utmost dexterity is necessary to its perfect performance; so that being a good baker is one of the greatest recommendations a servant can bring with her.

Bannocks, which constitute in other parts of Scotland the common bread, are thick unleavened cakes, made of water and meal only; pease, barley, and oatmeal are all in use; the last most frequently. Sometimes milk, butter, or cream, with eggs or carraway seeds, are employed without any water. Now, a Scotch labourer will not allow wheaten bread to come into competition with these sorts to which he is accustomed. Habit is second only to nature; and whoever is at pains to measure his expenditure with his income, is not to be excused, if he will not use, for the staff of his life, the cheapest article, so long as it is wholesome and invigorating.

The principal advantage, however, which the labourers in the north have over those in the south, in the matter of diet, is the great variety of cheap and savoury soups to which they, almost without exception, devote every sort of butcher's meat. They never lose a drop of the liquor in which any species of meat has been boiled; for to roast is considered by the common people as the most prodigal manner of cooking it; since thereby they cannot convert water and vegetables into a nutritious soup. Could the use of barley, oatmeal, and soups be introduced into the south, the condition of the labouring classes would be at once wondrously improved.

The principal consumption of barley in the south is in malt liquor; and we think a given quantity of the same grain may be by the culinary art reduced into a soup, only by means of water, which will contain as much nourishment as beer. It is certain that a person might subsist entirely on barley broth, when porter would not support him. Count Rumford says, that each portion of barley soup should consist of one pint and a quarter for one person, which, if rich, will afford a good meal to a grown person; and that such a portion will weigh about one pound and a quarter, or twenty ounces averdupois. That the basis of each portion should consist of one ounce and a quarter of barley meal, boiled with one pint and a quarter of water, till the whole be reduced to the uniform consistency of a thick jelly. All other additions to the soup help, of course, to make it more palatable.

In the north, milk forms a great portion of a labourer's food: indeed, give his wife oatmeal and milk, and she will astonish a fastidious appetite with her dainties; more especially, if a morsel of meat be now and then within her reach; for she is sure to have a little garden, and then what else does she require? Certainly beer is not likely to be within her doors or mouth for years. In the south, however, the practice of keeping cows is not nearly so general as in the other direction. Before we close this paper, we shall have to speak of cottage farms, and therefore can only here at present lament that milk is such a minor point in any part of the empire. With regard to milk, broths and soups, we are aware, however, that a strong aversion prevails in the south. They are condemned as washy stuffs, only fit for hogs; and it is said such liquids will not "stick to the ribs."

There certainly is a medium between food that is entirely liquid, and what is entirely solid; and when we consider the toughness of, and the thirst occasioned by, the expensive sustenance of London labourers, for instance, perhaps we may find that the liquid which they are inclined to swallow amounts in quantity to as much as is usual with the same class in the north. Beer is expensive, and if the labourer cannot afford this beverage, quantities of weak tea, with a little sugar or milk, are resorted to. In the north, and among poor labourers, tea is not an every day indulgence; whilst amongst those that are respectable, it is only an afternoon dainty. Beer, again, is unknown amongst them, unless when at market or when gay. The limpid stream, whey, or milk, is their beverage: the two first are cheap—the last feeds whilst it allays the thirst. Drunkenness, no doubt, is prevalent in both quarters of the island, amongst the worthless. But what we say is true, that no species of strong and expensive drink, excepting milk, is at all considered as a necessary of life in the north. If a labourer in the south, whose habits are temperate, were to count his yearly expenditure in beer, we think he would be staggered: or, setting the prejudice aside, were he to compare its value with the milk that thereby might have been procured, and turned to various purposes, would he not be ashamed? and last, but not least, let him consider the temptations connected with beer drinking, compared with the circumstances of the sorts of beverage we recommend. We are confident, that so long as he patronizes soups, pure water, cheap whey, or nutritious milk, he neither will awake in the morning with a head-ache from his debauch, nor find his pocket unfairly managed, nor encounter many dangerous associates. There are, however, other things besides food and drink, necessary to man's welfare;—*Fuel* is a strong instance.

It must be confessed, that, as respects firing, the poor man in the south of England has obstacles to encounter beyond those in the north, and this affects, in no slight degree, his culinary practices, and causes him, for instance, to send his meat on a Sunday to the baker's. But it may be doubted, whether the same fuel which is required to boil a tea-kettle twice a day is not sufficient, with proper management, to dress various kinds of soup. It is to be regretted, however, that the habitations of the poor, for the most part, are badly adapted for culinary processes. There is great room here for improvement and ingenious contrivances. One very obvious truth is, that the size, the position, and the form of the fire-place, may cause a most wasteful, as well as uncomfortable current of air. The slightest pains may at any time narrow the throat of a chimney, immediately above the mantel piece, and circumscribe the dimensions of the fire-place, when they are too large. But, of course, the position of such an essential feature in any apartment belongs to the builder of the mansion. We refer our readers on this point, to the plans for such dwellings as we are treating of, given in our last number. It is not to be questioned, however, but that many economical inventions may be used to obtain heat and firing, not at present known. It even appears, that long ago, in England, several artificial means were used, as we have discovered from certain old documents in

the British Museum. The curious may wish to see somethiog of what our ancestors did in this way. The scarcity and high price of provisions during the civil wars turned the attention of the people to many important subjects of domestic economy; and the following "Good news for the Poor" seem to have been circulated about that period of time.

"'Tis certain," says the writer of these good news, "necessity is at the most times the parent of ingenuity. To pay forty or fifty shillings for a chaldron of coals went deep into a tradesman's pocket. Whereupon some plodding industrious heads, that had seen fires of turf or peat in the country, or been in Holland, where (as one saith pleasantly) they fetch fire out of water, burning a kind of mud taken out of their ditches and dried, began to think of mixing clay with their coals, which they found succeed so well, that several eminent victuallers and coffee-houses (particularly near the Royal Exchange) make it now their common fuel, to their great advantage. The manner of doing it is thus:—

"Take two loads, that is to say, a chaldron of coals, and cause them to be sifted in a wide-hole sieve; that so all the dust and small coals may go through, and the great round coals remain behind. Then take a load of clay, and cause it to be mixed well together with the said dust or small coals; for which purpose, if your clay be not moist enough to work up well, you may wet it a little; then make it up either in round balls, or like bricks, but let them not be above half so big every way; and then letting them lie for some time to dry well, they will be fit for use: for having laid a small thin bottom of coals, you must then lay on these pieces, intermixing now and then one of your round pieces of coal among them: this shall produce you a most rare fire, burning more clear, and casting a greater heat than all coals: it shall continue fresh and in good order, with very little trouble, a whole day, and is not offensive in smoke, smell, or otherwise." Such is the receipt. The writer goes on to say, that this will last longer than any three chaldron of coals. He adds—"Some have thought it convenient to put in a matter of two sacks of saw-dust to the aforesaid clay and coals, and upon experience find it does very well, drying the clay, and making it the sooner fit for use."

Balls of small coal, mixed with clay, are said to have been much used all over South Wales, particularly in the counties of Pembroke and Carmarthen. They are formed about the bigness of a man's feet, great in the middle, and verging smaller towards the ends. They are generally made up and put upon the fire quite wet, in the form of a pyramid; and, when thoroughly lighted, make a most brilliant appearance. One of these fires will last ten or twelve hours. Those who live near the sea, instead of clay, use mud taken from under flood-mark at low water; which, from the quantity of salts it contains, makes the ashes a valuable article of agriculture to the husbandman, and in horticulture to the cottager; for every cottager in South Wales has a little garden, in which he grows his own leeks, potatoes, cabbages, cole-worts, pease, &c. The balls mixed with mud emit no disagreeable smell in burning.

But this is a subject which we rather endeavour to bring before the eye of the philanthropic and ingenious, than to afford any thing new of our own, not despairing that great improvements and savings may be accomplished, to the apparent benefit of the poor. Cheap, yet comfortable houses deserve attention here, as immediately bearing, in an eminent degree, upon the condition of the labouring classes. To what is to be found on this point in our last number, we add; that the sorts of cottages seen in the different parts of the island are extremely various: being of clay, brick, wood, or stone. Those of wattle and daub, as they are called, are perhaps the warmest; those of brick or wood the driest; and those of stone the most durable. The mode of building those of the first mentioned class, in the county of Dumfries, is, according to the Statistical account of the parish of Dornock, as follows; which, as regards cheapness and expedition, perhaps is unrivalled in this country.

"The farmhouses in general, and all the cottages, are built of mud or clay." (Of late years, however, we remark, masonwork has come much more into use than formerly in that district.) "These houses, when plastered and properly finished within, as many of them be, are exceedingly warm and comfortable. The manner of erecting them is singular. In the first place, they dig out the foundation of the house, and lay a row or two of stones; then they procure from a pit contiguous, as much clay or brick-earth as is sufficient to form the walls; and having provided a quantity of straw or other litter to mix with the clay, upon a day appointed the whole neighbourhood, male and female, to the number of twenty or thirty, assemble, each with a dung-fork or spade, or some such instrument. Some fall to working the clay or mud, by mixing it with straw; others carry the materials; and four or six of the most experienced hands build, and take care of the walls. In this manner the walls of the house are finished in a few hours; after which they retire to a good dinner and plenty of drink, which is provided for them, where they have music and a dance, with which and other marks of festivity they conclude the evening. This they call a *daubing*, and, in this manner, they make a frolic of what would otherwise be a very dirty and disagreeable job.

The diversity in the mode of preparing food is not greater in the north and south of Great Britain than in the styles and kinds of dress.

In the midland and southern counties, the labourer in general purchases his clothes from a shop-keeper. In the neighbourhood of London, he usually purchases second-hand articles. In the north, almost every article worn by the lower orders, not many years ago, was manufactured at home, excepting shoes and hats, and still is to a characteristic extent; though the midland system has rapidly gained ground of late. In Scotland amongst the peasantry, linen, stockings, and flannels continue to be generally made at home. We may say indeed, that the labourer is poor, or worthless, who has not an enviable web of linen, grown, spun, and bleached by his wife and daughters. Such a web as will serve for winding sheets or wedding shirts for every one of the family is commonly found; and preserved not merely to be shewn a visitor for its beauty, but as a symbol of affecting anticipations. There are therefore strong moral feelings of an excellent order connected with this article. The labourers week-day shirt is a strong and coarse cloth, made of the refuse of the fine lint. Farm servants and labourers knit their own stockings, which is their usual employment throughout long winter nights; and as the thread is spun at home, and generally of three plies, about eleven ounces of wool go to the pair. All these home-made articles are comparatively expensive at the first, but they greatly more than cover this, by their durability and comfort, over those which are purchased in the market. In the Highlands again, every man is Jack of all trades; and many a family appear at kirk and market, neat, tidy, and almost fine, whose dresses have never been brought from more distant quarters than the neighbouring hills, where the wool is reared on the patch of adjacent land where the flax is grown.

It is quite clear, however, that such primitive customs never will be introduced in more populous or enlightened districts, neither should we have made these observations respecting dress, were it not that many sterling virtues seem to go hand in hand with homely manufactures; and that it is to be greatly lamented, labourers' wives and daughters of the present day are inclined to scorn the most becoming frugal habits of domestic economy. But besides many *fireside* practices which with great advantage might be introduced amongst the lower orders, there are some out-door operations to be warmly recommended to the cottagers in landward parts, to which we now proceed: we mean the culture of a patch of ground, embracing a garden, and a small allotment, for more extensive operations, in the style of farming.

There are a great many cottagers who might, with the utmost advantage to themselves, and of course to the community, cultivate a small piece of land. We know there has been, and still

is considerable diversity of opinion on this subject; although of late the *Allotment System*, as it is called, has been gaining able advocates; whilst the great alteration contemplated by the Poor's Law Amendment Bill, there is little doubt, will give an additional weight to the discussion. To cottage farms, one of the most commonly urged objections is, that they make of country labourers, not only bad servants, but also bad farmers. We admit that there is a good deal in this, when those farms amount to four, five, or eight acres or such like. But what we recommend is more properly called an *allotment* than a farm, and should run in extent somewhere near one acre of land; but never above one and a half. At any rate that the management of these should never interfere with the regular employment of the cottager; and yet that the possession of a cow should be an object of first-rate consideration.

We are not going to be particular in our rules as to how the cottager's garden, and allotment of land, are to be cultivated. The great feature which we would have to be introduced is the keeping of a cow, and therefore the crops raised should have a particular respect to this object. Much variety and enlivening beauty might be imparted to many dreary wastes of the country, were this system generally introduced among our rural labourers and artizans. But there would be something better; there would be a moral health spread amongst the lower orders, which is ever inseparable from the natural and primitive character of the operations referred to. Active and virtuous children are reared where the spade, the flail, and the stable afford them a regular recreation. But think of the degraded class who seldom rear a third or second child without parochial aid! We have known such, who, had they, instead of sending miles for a drop of milk, been gifted with or possessed of this docile, most useful animal, for the poor-man's household, of which we speak, a totally opposite domestic picture would have been presented, not merely as respected comfort, but purity of life.

But instead of general assertions and theoretic fancies, it fortunately is in our power to substitute facts and the truths taught by experiment: to these we now call the attention of our readers. Sir John Sinclair tells us of an experiment tried on a large moor farm in the highlands of Scotland. Two acres of arable land or fit to be made arable was allotted the cottager, together with a house and garden, the proprietor becoming bound to employ him for 100, 200, or 300 days in the year, as the cottager chose: paying him so much grain and so much money, in proportion to the number of days agreed on. Thus the labourer, in a manner, received rent from the landlord, instead of paying any. This measure was adopted with great success with a number of cottagers: nor could any be better devised for the benefit of a thinly peopled country. General improvements may thus be carried on by residenters; so that it seems worthy of the attention of extensive proprietors in similar situations. It ought to be added, that, as Sir John farther mentions, whilst the men were employed by the proprietor, the women managed the cottage farm at home.

And this brings us to a case, which we find quoted by Mr. Davies, author of a View of the Agriculture of North Wales. On Pulley common, he says, in Shropshire, there is a cottager's tenement, consisting of somewhat more than one ninth of an acre. The spade and the hoe are the only instruments used, and those chiefly by his wife, that he may follow his daily labour for hire. The plot of land is divided into two parcels, whereon she grows wheat and potatoes alternately. In October when the potatoes are ripe, she takes off the stalks of the plants, which she saves to produce manure by littering her pig. She then goes over the whole to collect the weeds for the dunghill. She next sows the wheat upon the surface, and then takes up the potatoes, with a three pronged fork; and by the same operation, the wheat-seed is covered deep. She leaves it quite rough, and the winter frost mellows the earth, and by its falling down in the spring, it adds vigour to the wheat plants. She has pursued this alternate system of cropping for several years. The potatoe crop only has manure. In 1804, a year very noted for mildew, she had fifteen Winchester bushels of wheat from 272 square yards; being four times the general averaging crop of the neighbouring farmers.

What has been the Shropshire cottager's history since 1804, we have not learnt, but the somewhat distant date of the case cannot affect the principles we seek to inculcate. Neither does the remoteness of the era, to which the following minutely detailed facts relate, weaken their force. The example, and the manner in which it is explained, seem so applicable to our present purpose, that we cannot do better than make use of them, which we now enter upon. What we refer to, is an account of a parish, drawn up by Thomas Estcourt, Esq. M. P., and presented to the Board of Agriculture in 1804. He tells,

That *Long Newnton* contained 140 poor persons in 1800. They were willing to exchange their claims to parochial relief for any other aid, suitable to their habits, that would yield, with their labour, a better prospect of procuring the common domestic comforts of life. Upon this, it was proposed,

That each cottager on his application for the same should become tenant of a small quantity of arable land, under proper restrictions, and at a fair rent; but that no person should be allowed to occupy more than the family of such person could cultivate, without improperly interfering with his usual labour; nor more than he could procure manure to keep in high fertility; that the large families should not therefore occupy more than one acre and a half, the smaller families less, in proportion as their numbers were fewer and not likely to increase.

That the rent of the land should be at the rate of one pound, twelve shillings per acre. It was never known before to bear more than twenty bushels of wheat to an acre, under the best cultivation, and would have let to a farmer at about twenty shillings per acre.

That one-fourth part of the land in each person's occupation, should annually be well manured in rotation, and planted with potatoes; that the remainder should be managed as the tenant should think proper, except that no person should have two exhausting crops of corn (viz. wheat, barley, oats, rye) successively.

That the land should be forfeited to the landlord if not cultivated and manured as above mentioned; or if the tenant should be lawfully convicted of a felony, or any other offence against the law, for which he would be liable to a fine, or imprisonment.

That it should be forfeited, if the tenant should receive any relief from the poor rates, except medical assistance, and except such relief as the family of any tenant should receive, under the authority of any law relating to the militia, or any other act of parliament that might afterwards pass, of a similar description, for the defence of the country.

That the land should be granted, if required, for a term of fourteen years; but the lease or agreement, should be void, by either party giving the other three years' notice of such avoidance.

This was the offer made them. They entered warmly into the idea; promised every possible exertion on their part to give it success; and all accepted the offer, except two widows with numerous families of young children, and some very old infirm persons without families, who had not the courage to make the experiment.

The high price of provisions at that time, notwithstanding they all had a very liberal allowance from the poor rate, had run them so much in debt for the common necessaries of life (chiefly for bread), that, it being deemed essential to their success that they should be freed from these incumbrances, money was advanced on loan amongst them, in proportion to their wants, amounting to the sum of forty-four pounds sterling.

At Lady-day in 1801, each person entered on the first part, or one-third of the land allotted to him; at Lady-day, 1802, they entered on one-third more; and, at Lady-day, 1803 on, the remainder.

Now, as to the result that speedily followed this arrange-

ment. The only persons who had received any relief from the poor-rate of this parish after Michaelmas, 1801, were the four old infirm persons before mentioned (two of them died soon afterwards), and the two widows with large families. The two widows, after a time, rather than go with their families to a work-house, were, at their own request, put on a footing with their neighbours, and received no relief from the moment their first crop came into use; the one having six, the other eight small children, the eldest not twelve years of age. No person in 1804 had forfeited his land; but three single men had asked leave to resign theirs, being able to subsist very well by their labour.

Mr. Estcourt goes on to state a great many other striking circumstances concerning this allotment experiment, which we must abridge. He says, one circumstance was particularly gratifying, viz., that those poor persons who had the largest families, and were the heaviest charge to the parish, were those who set the highest value upon their land, and the most anxious therefore to avoid any act by which it would be forfeited. The hoe was actually employed by the women and children to keep the crops clean, who also performed almost all the other operations, excepting tilling and the carriage of manure and produce. They soon discharged every debt owing by them, and nothing, when Mr. Estcourt wrote, could reduce them to the necessity of again applying for parish relief but some severer calamity than they had ever been visited with. There is this other obvious benefit resulting from the experiment described; the people felt themselves obliged to look forward, and to provide against occasional distress, which stimulated them to increased industry and economy. The farmers of the parish too admitted that they never had their work better done, nor found their servants more able, willing, civil, and sober.

Mr. Estcourt farther states, that although the keeping of a cow is justly deemed a very beneficial practice to a poor family, yet, as it is attended with some difficulties in certain situations, it was thought proper not to make it a necessary part of the experiment; but as the poor are frequently discouraged from economical practices on account of not being able to employ to advantage any small sum they may save, it was proposed that if any person could buy a cow, it should be taken in to joist at five pounds four shillings per annum; nor was it long ere a cow or two had been purchased, whilst the other cottagers were looking eagerly forward to their being able to do so also. One thing deserves to be observed, that if charity alone were the object, in such an experiment as we have now detailed from Mr. Estcourt's pamphlet, a better mode of it could not be devised than that which enables the poor man to exert with effect and with honest freedom that strength and those faculties which Providence has blessed him with for the benefit of himself and the support of his family. But it does more, for, whilst it confers blessings upon the poor, it embraces the interests of the rich, and adds to the welfare of the whole frame, moral and national, of society.

Various matters might be suggested as improvements upon the experiment made at *Long Newton*; and we had proposed to ourselves to go at some length into their statement. But what has already been said will enable any person who feels earnest on the subject to point out for himself such things in a manner more satisfactory than there is room for us at present to do. Nor are we willing to injure the effect of the facts given, by any speculation on such momentous questions as the welfare of the labouring classes embraces. The introduction of milch cows, and a little dairy business, are the things we should greatly desire to have added to the allotment—farmers' domestic economy.

THE FINEST VARIETIES OF FRUIT TREES FOR THE SOUTHERN OR MIDLAND COUNTIES OF ENGLAND.

The following list of fruit trees, drawn up from the experience of some of the most competent judges in this country, will be found highly worthy of the attention of any one anxious to form a select collection. The different kinds contained in every nurseryman's catalogue are so numerous, that it is a matter of the greatest difficulty to know which to choose. In the Horticultural Society's Catalogue, published in 1826, there are no fewer than three thousand varieties, to which fifteen hundred more might be added. Of this multitude, however, more than a half are unworthy of being cultivated; and of the remainder, not above one quarter can be called first-rate kinds. In the collection which follows, the second-rate and doubtful sorts are left out, as also many common ones, when these ought to be supplanted by newly-raised varieties. We only have to intimate further, that none shall be named that may not be easily procured.

APPLES.

Adam's Pearmain. Dessert. Winter and spring.
Hubbard's Pearmain. Dessert. Winter and spring.
Golden Reinette. Dessert. Autumn.
Dutch Mignonne. Dessert. Spring.
Gray French Reinette. Dessert and kitchen. Winter and spring.
Franklin's Golden Pippin. Dessert. Autumn.
Golden Harvey. Dessert. Winter and spring.
Early Red Margaret. Dessert. July.
Juncating. Dessert. July.
Boston Russet. Dessert. Spring.
Canadian Reinette. Dessert and kitchen. Winter and spring. Excellent.
Norfolk Beaufin. Kitchen. Spring. Good for drying.
Traver's Pippin. Dessert and kitchen. Autumn and winter.
Court of Urick. Dessert. Winter and spring.
Cornish Gilliflower. Dessert. Winter and spring. Bears badly, but is rich.
Ribston Pippin. Dessert and kitchen. Winter.
Old Nonpareil. Dessert. Winter and spring.
Scarlet Nonpareil. Dessert. Winter and spring.
Dumelow's Seedling. Kitchen. Winter and spring.
Newtown Pippin. Dessert and kitchen. Spring; tender, requiring a wooden frame or east wall.
Cockle Pippin. Dessert. Spring.
Kerry Pippin. Dessert. August and September.
Oslin. Dessert. September.
Blenheim Pippin. Dessert and kitchen. Autumn.
Winter Codlin. Kitchen. Winter.
Mank's Codlin. Kitchen. September.
French Crab. Kitchen. Spring and summer; may be kept for two years.
Gloria Mundi. Kitchen. Autumn and winter.
Beauty of Kent. Kitchen. Autumn and winter.
Lucombe's seedling. Kitchen. Winter.
Rhode Island Greening. Kitchen. Winter and spring.
Minshull Crab. Kitchen. Winter.
Northern Greening. Kitchen. Winter and spring.
Duchess of Oldenburgh. Dessert. September and October.
Malcarle. Dessert. Spring. Tender; requires a south wall.
Sykehouse Russet. Dessert. Winter and spring.
Royal Russet. Kitchen. Winter and spring.
Beauchamwell Seedling. Dessert. Winter and spring.
Court Pender. Dessert. Spring.
Wormsley Pippin. Dessert and kitchen. Autumn.
Hawthornden. Kitchen. Autumn.
Sugarloaf Pippin. Dessert. July.
Downton Pippin. Dessert. Winter.
Brabant Bellefleur. Kitchen. Winter and spring.
Gravenstein. Dessert and kitchen. Autumn.
King of the Pippins. Dessert and kitchen. Autumn.
Sam Young. Dessert. Winter.
Alfriston. Kitchen. Winter and spring; very large.
London Pippin. Kitchen. Winter and spring.
Bedfordshire Foundling. Kitchen. Autumn and winter.

PEARS.

Jargonelle. Dessert. Wall or quenouille. August.
Beurré d'Aremberg. Dessert. Wall and standard. October and November.
Beurré Rance. Dessert. Standard. March and May; the best late melting pear yet known.
Gansel's Bergamot. Dessert. October; east and west wall; indifferent bearer.
Beurré Diel. Standard. October and November; great bearer and excellent fruit.
Florelle. Dessert. Wall and standard. November and December.
Marie Louise. Dessert. Standard. October.
Summer Francréal. Dessert. Standard. August and September. A good bearer.
Winter Neilis. Dessert. December; excellent.
Capiaumont. Dessert. Standard. October; great bearer.
Chaumontelle. Dessert. Wall, standard, or quenouille. Winter.
Flemish Beauty. Dessert. Standard. October and November; must be gathered early.
Duchess of Angouléme. Dessert. Wall and standard. October and November.
Easter Beurré. Dessert. Wall and standard. January, February, and March; great bearer, and excellent.
Napoleon. Dessert. Wall and standard. November.
Early Bergamot. Dessert. Standard. August and September.
Autumn Bergamot. Dessert. October.
Bezy de la Motte. Wall and standard. October.
White Doyenné. Dessert. Wall and standard. October; good bearer.
Passe Colmar. Dessert. Wall and standard. December and January; great bearer; trees not subject to canker; excellent fruit.
Colman. Dessert. Wall. December till March; trees subject to canker.
Nutmeg. Dessert. Standard. Winter; small, but a good bearer.
Swan's Egg. Dessert. Standard. November and December.
Crasanne. Dessert. Wall. October and November; shy bearer.
Hacon's Incomparable. Dessert. Standard. November and December; tree hardy; great bearer; excellent.
Whitfield. Dessert. Standard. November; good bearer.
Thompson's. Dessert. Standard. November; one of the finest Flemish pears; good bearer.
Madeleine. Dessert. Standard. End of July; a good bearer.
Sockle. Dessert. Wall and standard. October; a plentiful bearer.
Vallée Franche. Dessert. Standard. August and September; a plentiful bearer.
Passans de Portugal. Dessert. Standard. August; good bearer.
Bezy d'Hery. Stewing. Standard. Winter; good bearer.
Chaptal. Stewing. Standard. Winter and spring.
Bequésne Musqué. Stewing. Standard. Winter; a great bearer.
Francréal d'Hiver. Stewing. Standard. Winter.
Uvedalés St. Germain. Stewing. Wall. Very large.
Rouselet de Rheims. For drying.
Neplus Meuris. Dessert. Standard. January till March a good bearer.

CHERRIES.

Elton. Wall and standard. Beginning of July; finest pale cherry yet known.
Late Duke. Standard. August; a great bearer.
Black Tartarian. Wall. June, July.
Belle de Choisy. Standard. Beginning of July.
Knight's Early Black. Wall. June.
Black Eagle. Wall and standard. July; good bearer.
Downton. Wall and standard. July.
Bigareau. Standard. Late.
Florence. Standard. Late.
Waterloo. Wall and standard. Beginning of July.
Morello. Standard and north wall. Late; preserving.
May Duke. Wall and standard. End of June.
Purple Griotte. Wall and standard. Beginning of June; the finest early cherry.
Kentish or Flemish. Standard. July; preserving and kitchen use; great bearer.

PLUMS.

Purple Gage. Wall and standard. September and October; the finest dessert plum of its colour.
Green Gage. Dessert. Wall and standard. August and September; preserving.
White Magnum Bonum. Wall and standard. September; kitchen.
Isabella. Dessert. Wall and standard. September.
Kirke's. Dessert. Wall. September.
Nectarine. Dessert. Wall and standard. Beginning of September.
Coe's Golden Drop. Dessert. Standard and Wall. October; excellent bearer; dries, delicious.
Blue Imperatrice. Dessert. East or west wall. October.
White Imperatrice. Dessert. Wall. September; tender.
Mimm's. Dessert. Kitchen. Wall. August and September.
Washington. Dessert. Wall and standard. September.
Drap d'Or. Dessert, and earlier than the Green Gage. Wall and Standard. A good bearer.
Catherine. Preserving and Dessert. Wall and Standard. End of September.
Gisborne's. Kitchen. August. Standard. Forces well. A good bearer.
Orleans. Kitchen. Standard. August. Good bearer.
Early Orleans. Kitchen. Standard. Beginning of August. Good bearer.
Little Mirabelle. Wall and Standard. September. Small, but excellent for preserving. Good bearer.
White Damson. Preserving. Standard. End of September.
Shropshire Damson. Preserving. Standard. September and October. Great bearer.
Bullœau. Kitchen. Staudard. October and November. Great bearer.
Winesour. Preserving. Standard. October.

PEACHES.

Royal George. Beginning of September. Freestone. Forces well.
Madeleine de Courson. Beginning of September. Freestone.
Noblesse. September. Freestone.
Early Anne. Middle of August. Freestone.
Grosse Mignonne. End of August. Freestone. Forces well.
Bellegarde. Middle of September. Freestone. Large and excellent. Forces well.
Barrington. Succeeds the Royal George. Freestone. Forces well.
Chancellor. Middle of September. Freestone.
Royal. End of September. Freestone. The finest late sort.

APRICOTS.

Hemskirke. Dessert. Wall. End of July.
Royal. Dessert. Wall. End of August.
Large early. Dessert. Wall. Middle of July. The best early Apricots.
Breda. Dessert and preserving. Standard. August.
Moorpark. Dessert and preserving. Wall. August.
Brussels. Preserving. Standard. Beginning of August. Good bearer.

Orange. Preserving. Wall. A Clingstone. August.
Turkey. Dessert. Wall. Late in August.

NECTARINES.

White. Beginning of September. Freestone. Tender.
Elruge. Beginning of September. Freestone. Good bearer and forcer. Rich. The finest known.
Violet. Beginning of September. Freestone.
Pitmaston Orange. Beginning of September. Freestone.
Old Newington. Middle of September. Clingstone.

PINES.

Queen.
Enville.
Providence.
Black Jamaica.
Antigua Queen.

NUTS.

Casford.
Frizzled Filbert. A good bearer.
Cob Nut.
Red Filbert. A bad bearer.
Spanish Nut.
Pearson's Prolific. A great bearer.
Knight's Large. Very fine.

CURRANTS.

Black Naples.
White Dutch.
Red Dutch.

GOOSEBERRIES—RED.

Broadman's British Crown. Large.
Roaring Lion. Large. Late.
Red Warrington. Large. Late.
Red Champagne. Small.
Small Dark Rough Red.
Early Black. Small.

WHITE.

White Crystal.
White Champagne. Small.
Crompton's Sheba Queen. Large.
Woodward's Whitesmith. Large.

GREEN.

Mossey's Heart of Oak. Large.
Edward's Jolly Tar. Large.
Pitmaston Green Gage. Small.
Early Green. Hairy. Small.

YELLOW.

Prophet's Rockwood. Large.
Haywood's Invincible. Large.
Yellow Champagne. Small.
Rumbullion. Small.

RASPBERRIES.

Barnet.
Red Antwerp.
Yellow Antwerp.
Bromley Hill.
Double Bearing.

STRAWBERRIES.

Duke of Kent's Scarlet. Earliest of any.
Elton Seedling.
Roseberry.
Downton.
Keen's Seedling.
Black Roseberry.
Grove-End Scarlet.
Old Scarlet. Valuable for preserving.
Old Pine.
Sweet Cone.
Alpine Red and White.
Prolific Hautboys.
Large flat Hautboys.

VINES.

For the open Wall.

Black July.
Miller's Burgundy.
White Sweet Water.
Common Muscadine.
Pitmaston White Cluster.
Cambridge Botanic Garden.
Esperione. Sometimes ripens well.
Chaselas Musqué.

For the Vinery.

Black Hamburgh.
White Frontignac.
Black Ditto.
Muscat of Alexandria, White.
Verdelho, White.
West's St. Peter's, Black.
Horsforth Seedling, Black.
Black, or Morocco.
Poonah, Black.
Royal Muscadine, White.
Black Damascus.
Grove-End Sweet Water, White.

ON THE NATURAL SYSTEM OF BOTANY.

The botanical student, who has rambled over mountain and marsh, with a box under his arm, and a bundle of grass or a shrub in his hands, must have been conscious how like one demented he often appeared to the unlettered rustics; and while the query, so invariably put to him, '*What is that good for?*' received no satisfactory reply, how plainly their looks, more expressive than language, told him, that he had better stop gathering good-for-nothing weeds, and take to some honest and profitable employment. This thing is too common to be wondered at, and is moreover easily enough explained on the ground of ignorance of any end or object in science, save that of the most direct practical utility. But how is it to be accounted for that men, whose education and intelligence, we should suppose, must have carried them beyond such unworthy views of the nature of science, too often entertain notions respecting botany, as confused and mean as those of the most uncultivated mind? Why is it that they can look on the plants of the field, clothed in the rich garniture of a summer month,—in spite of the beauty that allures their gaze, and the admirable arrangement of organs, whereby the whole economy of vegetation is maintained,—without receiving any uncommon ideas of wisdom or power, and perhaps turn away from them all, as unworthy of a passing notice? Why is it that they can hear of the labours of botanists, of their travels by sea and land, amid suffering and privation, with no other effect, perhaps, than to call up more vividly to their imagination the picture or caricatures of an enthusiast devoted to a favourite science?

The truth, indeed, is too obvious to be questioned, that botany doesnot bear that character of dignity and importance in the public view, which has long since been obtained by many other of the natural sciences. This may be sufficiently explained,—at least, we know nothing else that can explain it,—by the single fact, that very little has been done by its friends towards introducing to general attention the more elevated and philosophical portions of the science,—those

only that can make it respectable with thinking and well educated minds. When a person lights upon a botanical book, and finds it,—as nineteen times out of twenty he will find it,—a catalogue of hard names, followed by still harder descriptions in an unknown tongue, or it may be designed for juvenile minds, and of course presenting nothing to him very striking in point of novelty or importance, it is not to be wondered at that he should imbibe no favourable impressions concerning it. From such we might reasonably expect to hear the complaint, that botany has furnished none of the useful and astonishing results of chemistry; that it gives rise to none of those grand and overpowering conceptions, which the study of astronomy crowds upon the mind; that we find in it little of the strong dramatic interest so powerfully awakened by the changing scenes of creation and destruction which geology displays. In short, however well calculated its study may be considered to arrest the attention and induce good habits of observation in the young, or to afford those of riper age a pleasing relaxation from other pursuits, it is too commonly regarded as destitute of those general views and profound discussions that require much thinking, or the exercise of a severe and precise logic. It may be said, and no doubt with justice, that such erroneous notions are the fault of those who entertain them, and that little knowledge of any subject can ever be expected, if a man can be turned from its pursuit at the first appearance of a technical word, or confine himself to the pages of a school-book.

Had half the efforts been made to present the science in a light at all worthy of its real merits, that have been used in teaching words, or disseminating loose and superficial views, its pretensions to a high character would long since have been seen and acknowledged. We should not now be obliged to say, at the risk of being suspected of exaggeration, that no science is more distinguished than botany for the enlargement and permanence of its general views, for the strictness and accuracy of its reasonings, for the sure and cautious deductions on which its great principles are established, for the demonstrations of the harmony and contrivance with which the organic world is ordered, and especially for a spirit of patient and profound philosophy, which alone can confer upon a science real dignity and value. To obtain a rank among the most distinguished botanists of the present day demands not only long and laborious investigation, but the exercise of talents that belong to the highest order of mind; for the relations to be discovered, and the principles to be deduced, must be the result of profound and untiring reflection. The laws whereby the vegetable economy is regulated, those which govern the affinities and differences of its various members, their distribution over the surface of the earth, and their connexion with the physical agents around them, are just beginning to be discerned, and their study will long present a field of inquiry, in which the most philosophical genius may find ample scope for the exercise of its powers. The whole end of botany is not accomplished when we have accurately described the characters of plants by which they are distinguished from one another, and given them a name and a place in the great register of nature; for we are thereby furnished with no better knowledge of the *plants themselves*, than we could obtain of the propensities and mental faculties of a runaway, from the advertisement that describes his clothes and person. Neither does the branch of physiology which teaches us the functions and general economy of plants furnish us with that particular knowledge of *the* plant that we wish, any more than the most intimate acquaintance with metaphysics or human anatomy would enable us to pronounce at sight upon the mental or physical habits of an individual man. The noblest end of botany, now, is to ascertain the points of resemblance and difference between plants, which associate them with and remove them from one another, to trace the progress of organization through all its gradations from its lowest to its highest forms, in short, to lay open the operation of all the causes which modify the conditions of their existence. This is that *philosophy of botany*, to the advancement of which the most eminent in its pursuit are directing their utmost efforts, and some more adequate notions of which are necessary to gain for it the general respect that it really deserves.

The great, the essential preliminary towards the attainment of this end,—if indeed it may not be more properly considered as comprising the end itself,—is to improve our classifications; for these involve so many considerations, — have reference to so many points in the history of the plant,—that when it is once fixed in the place to which it most naturally belongs, we are thus made acquainted with the most valuable knowledge concerning it, always excepting its practical uses, which are determined by experiment. Had this truth been generally recognised, and made the basis of improvement in botanical science, we should now be spared the regret that we experience, while looking back on its progress, to see how much labour and zeal have been expended on points of comparatively small or secondary importance, to the neglect of those that deserved the first and closest attention. We should not have to deplore that common misapprehension of the true nature and purposes of botanical classification, which has given rise to a fatal jealousy among men zealously devoted to the cultivation of the same pursuit, and lain like a blight on the growth of this beautiful science. While the number of described plants was small, and those but imperfectly known, the only motive that led to their systematic arrangement was the greater convenience it afforded of ascertaining their names, and in the facilities which it supplied for this object consisted the sole merit of the arrangement. The principle thus laid down, and which was well enough in the commencement of the science, continued, however, to maintain all its force long after the accumulated results of discovery demanded more ample and accurate information, more enlarged views, and a spirit of philosophizing that should concern itself with things rather than words. And, what is stranger still, after this kind of classification had been carried to its highest possible degree of perfection, and every thing been accomplished by it that could have been anticipated, it was looked upon as rendering any other on different principles and for different purposes altogether unnecessary, and all that remained for botanists was to add to the existing heap of crude and barren materials. The object indeed was an important, an indispensable one, and the mind that best accomplished it was one of no ordinary capacity; but, after all, it is only a means, and not an end, for which it seems to have been generally mistaken.

It is to be understood, that the difficulty under which naturalists laboured for a long time, and which operated as a serious check on the progress of science, was the want of a system, whereby the contributions to the common fund of information could be easily arranged and readily referred to by others. Without this their researches were almost vain, and their results unprofitable. The same necessity still continues. Fifty thousand species of plants have now been discovered, every one of which has been examined, its characters set down, its relations unfolded, and of many the properties and uses have been ascertained. But how is this knowledge to be referred to? With one of this immense multitude in our hands for the first time, how are we to ascertain a single fact concerning it, without previously making ourselves acquainted with its *name?* What clue is to guide us through the vast labyrinth of genera and species, and bring us at last to the very plant in question? Some system of arrangement or classification of course, is the only thing that will remove the difficulty, and those that have been constructed in direct reference to this point, viz. for ascertaining the *names* of plants, are called *artificial* or arbitrary methods, in contradistinction to the *natural* methods founded on the relations of plants, and indicated by nature itself. Each of these methods has distinct and peculiar purposes of its own, and when these are understood, and clearly kept in view, there cannot be a question

with those in the least qualified to judge, that both have a utility that is indispensable to the interests of the science. Simple and intelligible as this appears, yet an unaccountable delusion seems to have prevailed, that they are not merely different from, but opposed to each other; that their ends are the same, but attained by different routes; that their merits are conflicting, and are to be weighed in the same scales together. Opposition, jealousy, and party-spirit, have thus been excited, where naturally no foundation for them ever existed in difference of opinion or interest.

Bearing in mind the fact above stated, that in the artificial method the object is merely to ascertain the names of plants, we, of course, should not expect to find them arranged according to their general affinities, for a single organ may be assumed, and the differences which it presents in different species be made the basis of the classification. Thus, if we class plants according to the form, absence, presence, or some other condition of the corolla, with Tournefort, or of the stamens, with Linnæus, we shall bring species together, agreeing in respect to these organs, while in every other particular there may be the utmost possible difference between them. Plants, between which the most obvious family likeness exists, may be torn asunder, and placed in classes far remote from one another, the object being not to ascertain relations, but names. Though any part or quality of the plant may be made the basis of this method, yet its design will be best fulfilled when this basis is something inherent in the plant, easy to be observed, found in the greatest number of plants, and presenting sufficient variation in different species to make it easily and clearly expressed. The artificial methods were exceedingly defective, and about as numerous as the botanists who used them, till Linnæus, after devoting all his energies to their improvement, finally succeeded in constructing one which superseded every other, and has maintained its superiority to the present day, unrivalled and undisputed. Considering the stamens as uniting the conditions just mentioned to the greatest extent, he fixed upon these organs as the ground of his classification, and certainly no man, starting from a single idea, was ever conducted to more brilliant and durable results. His first eleven classes were founded on the number of stamens; the two next, on their insertion; the two next, on their comparative length; the five next, on their union; the three next, on their separation from the pistils; and the last, on their absence or obscurity. The remarkable facility which this method afforded for ascertaining the names of plants, and its admirable flexibility under difficulties, were so strongly contrasted with the deficiency and awkwardness of all previous contrivances, that we cannot wonder at all at the universal acclamation that greeted its announcement, or the hearty tribute of homage and thanksgiving bestowed upon its author. And still we ought not to forget the numerous other circumstances that contributed at the time to give popularity to the new system. Within a short period of its appearance, the rapid progress of discovery had made the defects of other systems more apparent and onerous than ever; the credit of discovering the functions of the stamens had just been given to his author; science was incalculably benefited by its introduction of specific names and characteristic phrases, and in his hands botanical nomenclature was endowed with a precision and force it had never before known. Add to this, that he had rendered important services to every other branch of natural history; the whole domain of nature had been subject to his researches, and he had every where left the impressions of his comprehensive mind. We mention this, not in disparagement of the sexual system, for we have no wish to detract in the slightest degree from its merits, but in order to account for the common disposition of its followers to give to it merits that it neither does nor can possess, and pertinaciously to claim for it an end never thought of by its author himself. It is not the first time that a man, who has done one thing well, has been supposed by his over-fond friends to have accomplished every thing.

In the natural method, plants are arranged according to their natural relations; those being associated together, which most nearly resemble one another in the whole of their structure and appearance. They are expected to agree not in one particular only, but in many; all minute and trivial characters are disregarded, while the prominent and striking features, being indicative of family resemblance, and connected with the general economy of the plant, are assumed as furnishing the only ground that should determine their relations. Every plant stands by the side of those it most resembles, and if our classes and orders are not defined by well-marked limits, but gradually blend together on their outskirts, it certainly is not our fault, for we do no more than preserve those family resemblances,—in fact, copy that arrangement of the vegetable tribes, which nature itself has made. So plain and numerous are the affinities that exist between certain plants, that little botanical tact is required to discern them; they are evident at sight to the least practised observer. Every body can see this strong family likeness between the different species of the Grasses, and of the Palms, for instance, and would expect to find them, in a natural classification, arranged by the side of one another. Let us not be misunderstood; nature has instituted neither classes, orders, nor genera. She has done nothing more than to throw together the various members of the vegetable kingdom, in groups of more or less distinctness and extent. It is our business to ascertain and define the particular conditions on which the affinities depend. They must necessarily be less obvious in some cases than in others, but are not on that account the less real and strong. Inasmuch as traits of consanguinity between different men may be discerned in their moral and intellectual resemblance, when their features and complexion would never betray the fact, so to discern the affinities of plants and animals, we must often go beneath the surface, and find, in more important parts of their structure, marks of relationship of the clearest and strongest kind.

This brief exposition of the objects of the artificial and natural methods of classification will show well enough their several uses in the study of botany, and enable our readers to see that while both are indispensable, the latter cannot be neglected, without entirely overlooking the grandest views and deepest principles that the science contains. An exclusive attachment to the artificial method accustoms the mind to partial observation and superficial views; for as the attention is directed solely to the sexual organs, and that only for the purpose of finding the name of the plant, it is perfectly obvious, that much in its history must go unknown and unstudied. The very convenience and facility which it continually affords incline the mind more and more to look at vegetables in a single point of view, and finally to regard this single object of finding their names, as constituting the whole science of botany. Incorrect notions relative to the nature of organs, and the force of characters, are insensibly imbibed; and while exaggerated estimates are made of the importance of some of these, most unphilosophical notions are entertained of the insignificance of others. In the natural method, on the contrary, not one, but all the organs pass under review, and are submitted to close examination before the plant can be traced to its place in the general arrangement, so that the process of finding its name acquaints one with the most valuable points in its whole history. Instead of referring directly to the specific description after a hasty glance at the stamens and pistils; the calyx, corolla, seed-vessel, seed, and general aspect, are also considered; and thereby the student becomes better acquainted not only with the plant, but with a variety of properties which it possesses in common with a great many others. The study of affinities, when applied to particular species, necessarily throws light on other species; a knowledge of one constantly illustrating and increasing that of others. On the score of convenience too, the artificial has but little advantage over the natural method, to one, who is already acquainted with a considerable number of plants. In most cases he would hardly trouble himself to count the exact number of stamens

in order to ascertain its name, for the first glance would show him its affinities with others that he had previously examined, and consequently lead him at once to its place in the natural system. Thus the relations that one plant possesses with other plants, and which form the most valuable part of its history, are already manifest before he has found its name; while he who neglects the study of the natural system is unable to advance a single step in the knowledge of the plant till he is master of this fact. The decided and emphatic testimony of Linnæus himself in its favouris a striking proof of the comprehensiveness and impartiality of his views, and is singularly contrasted with the misplaced jealousy of some of his disciples. He declares, 'that the natural method is the first and last object of botany;' 'that its fragments even should be diligently studied;' 'that none but poor botanists think it of little value; 'that it is the highest aim of his own labours and of those of every accomplished naturalist;' 'that he had made some discoveries, and that the man who would remove his few remaining doubts should be his *Magnus Apollo*.'

(To be continued.)

ON THE CULTURE OF FIGS.

The fig is a fruit of great antiquity, as we learn from ancient history that it was the principal article of food among the inhabitants of the Eastern Countries, before the use of wheat, barley, or any grain was known. The fig was cultivated with great care up to the period at which the Spaniards were suspected of giving poisoned figs to their enemies. No doubt an aversion to figs arose at that time, and the best mode of their cultivation was lost.

When I was gardener to Sir Chas. Monck, Bart. Belsay Castle, we had a house built expressly for figs. They were planted out in the border, in the same manner as vines. Several were in pots and tubs, which were kept in the orange-house, and some on a hot wall. Fig-trees are most fruitful when planted in a strong hazelly cool loam. Those planted in a light dry soil generally cast the first crop before it is ripe, and show a second crop on the wood the trees make that season. Trees in the open air, that are subject to casting off the first crop, do little good, for if the second crop be ever so plentiful the season is too far advanced to allow the tree to make wood and ripen the fruit, before the long cold nights set in.

Fig-trees in pots are most difficult to manage, as they are generally kept in a vinery, or some forcing-house. The soil in the pot being of the same temperature as the house, the tree becomes impatient, and if it sustain the least check for want of water, the fruit will, a few days afterwards, drop off. I succeeded best with those I had in pots, by putting them in a strong soil inclining to clay, and pressing it hard among the roots as I potted, placing them in that part of the house where they had plenty of air, and watering them plentifully when the fruit was swelling. I have had excellent crops of figs from trees against a hot wall. They were planted in a strong hazelly coloured soil. Old fig-trees are generally most fruitful, as their young wood is, for the most part, short jointed and spur-like, which is always fruitful. Young trees generally make long jointed luxurious wood, which is not to be depended upon for a crop. After the fall of the leaf in autumn, I cover the fig-trees on the wall with fern to protect the wood from injury by the frost. About the end of April I clear away the fern, and nail the branches regularly to the wall. In pruning I cut out any long naked shoots to give place for the lower branches. The young wood should never be shortened, as the best fruit is generally on the extremity. All shoots that push out in summer from wood of three or four years' growth I displace immediately, as they are glutinous and unfruitful. From April to the end of May, I cover the trees on the wall at night with canvass and bass mats, as several of the fruit at that time are as large as Mazagan beans, and the slightest frost would destroy them. During the summer months, I give them plenty of water over the leaves with the engine, thrice a week. Young healthy trees are liable to make a great length of young wood; when that is the case the sap flows too rapidly past the fruit, which thus starves and drops off. This may be prevented, if observed in time. In the month of June I examine the trees closely, and if the wood is making rapid growth, I ring the part from which the vigorous shoots issue. This immediately humbles the growth of the wood, and the fruit keeps pace and swells in proportion with it.

The fig-house in the gardens at Belsay Castle is of particular construction, being only four feet wide inside, the upright glass in front ten feet high. The border is prepared on the north side of the back wall, the wall being built on arches for the roots to get through. The trees are planted inside, and trained against the wall. There is no artificial heat to the house. The border was prepared with a strong hazelly loam, the soil which I use for melons, taken from the top of a lime-stone quarry. I never saw finer figs than were produced in that house, particularly the Dwarf Brown Naples, which got to a great size, and could not be exceeded in point of flavour.

W. G.

ON RAISING APPLE TREES FROM SEEDS.

BY J. TRIMMER, ESQ.

It may, perhaps, be interesting to some of your readers to know what was my success in a small experiment I made in raising apples from seeds.

I collected some apple-pips, all from good sorts of eating apples, and sowed them in the spring of the year 1802. During the first few years, those which came up were greatly reduced in number by several accidents, and afterwards by being removed to another garden at an unfavourable season of the year; all but three trees were killed, and those much retarded for several years in their growth. Of these three plants, one produced fruit the twenty-second year of its age, and proved a particularly juicy and very fine flavoured fruit, which keeps to the end of November; it is a very abundant bearer, but not a very strong growing or very healthy tree. The second tree fruited the twenty-fourth year; it is a sweet fruit, but there is nothing to render it worth propagating; though I still have the original plant, and it is equal in quality to many sorts that are still found in old gardens. The third tree produced fruit in the twenty-sixth, and I consider it a very valuable kind; the fruit is of a good size and appearance, and evidently allied, by its shape, to the

Pearmain. It is pleasaot as an eating apple; I know none that exceeds it for boiling; and it keeps particularly well to the end of April without at all shrivelling. Out of a good many sorts, it kept this year the best of any that I had; I used the last in the last week in April, and I do not doubt that many of them would have been good to the middle of May. It is a good bearer, and a remarkably healthy tree. I shall have much pleasure in sending you specimens of each sort for your opinion in the autumn, and afterwards cuttings for yourself, or such of your friends as may deem them worth grafting with.

I trained, a few years ago, a nectarine from seed, which fruited either the sixth or seventh year, I am not sure which. The fruit it produced was very like the Roman nectarine, but I think rather higher flavoured. The flesh parts, when ripe, separate very clearly from the stone.

I have stated these circumstances, thinking that, perhaps, they might be considered such as to induce others to raise fruits from seed, which must always be the source from whence we derive new sorts.

ON THE CULTURE OF PEAS.

As the different varieties of the garden pea cannot fail to be a subject of interest to society in general, perhaps it would not be considered altogether amiss to offer a few observations relative to their cultivation, &c. It is, I believe, a general practice for peas to be sown in rows, from two to five feet apart, according to the height which the different varieties grow; a practice of which I do not altogether approve, with the exception of the earliest crops, there being in general but certain compartments suitable for them. The method I have been in the habit of pursuing is, to sow the seeds of the second and after crops in rows, a considerable distance apart, say from twenty to thirty feet, according to the size of the kitchen garden, or the quantity required. The interval between the rows is cropped with other vegetables of dwarf growth, such as broccoli, savoys, cabbage, spinach, celery, &c., so that there may be no loss of ground. The tall peas, when sticked, are an advantage rather than otherwise to the intermediate crops when first planted, on account of the shade which they produce, and in addition to which the ground always appears fully cropped. It therefore must be admitted, that it adds to the beauty of the kitchen garden. By the above treatment the crop is increased fully one-third, and of superior quality. The produce of the common bean, and also of the scarlet runner, is considerably increased by the above mode of treatment. Respecting the hardiness of the different varieties, I am not at present able to give any decided information; but it has been confidently asserted to me, that some of the marrows, as well as other varieties, are equally hardy as the early frame, charlton, &c. If such is the case, and I have no reason to doubt it, how much sooner in the season might some of the finer varieties be sent to table? However, be that as it may, I propose to give the different varieties a fair trial, and hope to be able in due season to give you a detailed account of the comparative hardiness of each variety. The sugar peas are not unfrequently, when quite young, gathered, sliced in the manner of harrïots, French beans, and sent to table in that state. It may be necessary to add, that the soil in which the peas grew was a strong rich loam, and I have no hesitation in saying it is the best kind of soil for late peas, and for early peas I believe a light dry soil will be found to answer best. It is also a general practice, in small gardens particularly, to sow their peas too thick, which is greatly detrimental to the crops. As a criterion, I should recommend, for the earliest sorts, about a pint to every fifteen yards, and for the later kinds the same quantity to about twenty-five yards. The whole of the varieties of grey peas are unfit for garden culture. T.

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Description of the Plates.

CRATÆGUS CORDATA.

Heart-leaved Cratægus.

Icosandria Di-Pentagynia.—Linn.

Rosaceæ.—Jussieu.

Arbor mediocris, ramulis subangulatis, verrucosis. Folia cordata, basi subtruncata, acuminata, lobata, serrata, utrinque lævia, suprà lucida, atrohiridia, petiolis longis, lævibus. Floris albi, corimbosi, parvi, calicibus glabris, petalis rotundatis, apice denticulatis. Styli 5. Fructus sphærici, pisiformes, coccinei, carnosi, nuculis quinque osseis.

This handsome hardy tree is a native of North America, and forms a beautiful bush or small tree, flowering rather later than others of the genus, the blossoms beginning to open in the end of May, or early in June. It is much valued for the fine dark green glossy appearance of its leaves, and the vivid colour of its scarlet fruit, which will sometimes hang on the tree during the winter.

Young branches rather angular and warty. Leaves cordate, somewhat truncate at the base, acuminate, lobed, serrated, smooth on each side, above dark green and shining, with long smooth petioles.

TULIPA OCULUS SOLIS.

Persian Sun's Eye Tulip.

Hexandria Monogynia.—Linn.

Liliaceæ.—Jussieu.

T. Oculus solis; integumento bulbi intus lanato, foliis 4 subciliatis caule floreque glaberrimis, labris conniventibus stigmatum villoso-fimbriatis. *Ker. suprà, vol.* 3. *fol.* 204, with the synonyms.

β. Persica; foliis latioribus magis glaucis, perianthio maximo, integumento bulbi intùs hirsuto.

The Agen, or Sun's Eye Tulip, is singular in the genus for a deep black eye, or base to the perianthium in the inside, which is bordered by a margin of yellow interposed between it and the vermilion red of the rest of the perianthium: when expanded beneath the influence of a bright sun, the effect of this is surprisingly beautiful; the flowers rarely open under less favourable circumstances. Hitherto it has been only discovered wild in the South of Europe.

The roots of the common European kind are densely clothed with wool beneath the outer integuments,—a provision, as it would seem, by which Nature seeks to guard them from too severe cold. The Persian variety, which, it is to be presumed, has less need of protection of this kind, has, in lieu of wool, a quantity of coarse hairs, forming a protection much less dense than that which exists in the European kind. May it not hence be suspected, that Persia is indeed the native land of the Tulipa Oculus solis, and that the individuals found in the places above mentioned are mere outcasts of gardens?

This should be cultivated at the foot of a wall with a rather southern aspect. The earth should consist of a light, loamy soil.

It is remarked by De Candolle that T. Oculus solis differs from T. Sauveolens, and from T. sylvestris, in not having hairs upon either its stem or its flowers; from T. Gesneriana in its pointed petals; and from T. Clusiana in its much larger flower, the claw of which is at least as long as the anthers, and in the arrangement of itscolours.

CLIVIA NOBILIS.

Scarlet Clivia.

Hexandria Monogynia.—Linn.

Amaryllideæ.—Jussieu.

Clivia.—*Perianthium* tubulosum, sexpartitum, deciduum, alciniis imbricantibus; exterioribus paulò brevioribus. *Stamin*, sex, æqualia, periantio basin versùs inserta; *filamenta* subulata, subinclusa; *antheræ* versatiles. *Ovarium* 3-loculare polyspermum. *Fructus* baccatus, indehiscens, monospermus. *Semen* carnosum; subrotundum.—Herba (*Capensis*), radicibus *fasciculatis*, foliis *distichis*, floribus *umbellatis pendulis*. Scapo *planoconvexo!*

Roots fleshy, fascicled. Leaves distichous, coriaceous, dark green, strap-shaped, sheathing at the base, retuse and oblique at the apex, rough at the margin. Scape erect, plano-convex, bordered, furrowed towards the summit. Flowers from 48 to 50, on long stalks, pendulous, arranged in an umbel. Perianth tubular, clavate, deciduous; the segments yellowish scarlet, greenish at the apex, obtuse, imbricated in a double row, cohering towards the base, the outer rather shorter than the inner, like those of a Lachenalia. Stamens six, inserted in the orifice of the tube, equal; filaments smooth: anthers small, oval, greenish yellow, versatile. Ovarium inferior, greenish yellow, 3-celled, many-seeded, round, ventricose. Ovula numerous, inserted towards the base of the axis; style filiform; stigma somewhat 3-lobed. Fruit berried, indehiscent, red, generally, in consequence of the abortion of two cells and most of the ovula, one-seeded, marked at the top by the scar of the fallen perianth. Seed single, ascending, (only seen unripe), very smooth, transparent, oval; hilum small, above the base; foramen in the base; raphe short, raised. Testa, when young, marked with very minute areolations; albumen abundant. Embryo ....

A greenhouse plant, not appearing to require particular care in its cultivation, and propagating either by seeds or suckers.

BILLBERGIA PYRAMIDALIS; VAR. BICOLORED.

Two-coloured Pyramidal Billbergia.

Hexandria Monogynia.—Linn.

Bromeliaceæ.—Jussieu.

B. *pyramidalis*; caule erecto: bracteis magnis spathaceis coloratis, spicâ subcapitatâ ebracteatâ.

Billbergia pyramidalis. Lindl. suprà, vol. xiii, fol. 1068, in notâ.

Bromelia nudicaulis. Suprà, vol. iii, fol. 203.

Bromelia pyramidalis. Bot. Mag. 1732.

β. bicolor, petalis obtusus bicoloribus, foliis magis acuminatis.

This is a native of some part of South America, and highly deserving of cultivation on account of the great beauty of its flowers.

SOPHORA VELUTINA.

Decandria Monogynia.—Linn.

Leguminosæ.—Jussieu.

Sophora Linn.—*Calyx* 5-dentatus, basi campanulatâ v. subattenuatâ. *Petala* carinalia sæpiùs apice concreta. *Legumen* moniliforme, apterùm, polyspermum.—Arbores fruticus *aut* herbæ, foliis *impari-pinnatis, sæpiùs exstipulatis*, racemis *terminalibus simplicibus paniculatisve*. Dec. prodr. 2. 95.

A fine greenhouse shrub, which well deserves a trial as a hardy plant: it is a native of Nipal, and was first raised some years since from seeds sent to this country.

Although we have referred it to Sophora, we are by no means satisfied that it is a genuine species of that genus, from which it differs very considerably.

This plant would, if naturalized in our shrubberies, be a very desirable addition to our collection of hardy plants.

GAILLARDIA ARISTATA.

Whole-coloured Gaillardia.

Syngenesia Frustranea.—Linn.

Corymbiferæ.—Jussieu.

Gaillardia Fougeroux.—*Involucrum* polyphyllum, imbricatum, squamis foliaceis. *Flosculi radii* ligulati 3-dentati neutri; *disci* tubulosi, persistentes, basi herbacei subsolidi, dentibus extùs barbatis, centro masculi, ad ambitum hermaphroditi. *Stigmata* subulata barbata basi pedicelliformia glabra. *Fructus* villosus turbinatus, teres. *Pappus* paleaceus. *Receptaculum* conicum paleaceum.

A nearly evergreen perennial, with fibrous roots. Leaves spatulate, tapering down into a long petiole, somewhat toothed, covered on both sides with numerous soft hairs, which are divided internally by several partitions; stem sessile, oblong, very entire, acute, very slightly amplexicaul at the base. The radical leaves are occasionally pinnatifid. Stems erect, taper, striated, with close-pressed hairs. Heads solitary, on very long stalks, erect. Involucrum imbricated, many-leaved; the scales foliaceous, finally reflexed, ciliated, the innermost being narrow. Florets of the ray 15, large, cuneate, 3-toothed, yellowish orange, neuter; of the disk purple, tubular, campanulate, with a short, green, taper, solid base; the lobes 5, acuminate, bearded; the florets are persistent almost until the ripening of the fruit, and change to a greenish colour; those of the centre are male, those towards the circumference female or hermaphrodite. Ovarium turbinate, villous; pappus paleaceous, aristate. Anthers with a little appendage at the apex, and acute lobes at the base. Style filiform, smooth. Stigmata purple, subulate, bearded, furrowed along the middle, with a smooth stalk. Fruit turbinate, taper, truncate, villous at the base, smooth at the apex. Receptacle conical, covered with subulate paleæ.

A handsome hardy perennial, found in North America by Mr. David Douglas.

It is, no doubt, the G. aristata of Pursh, which is considered a mere variety of G. bicolor. It appears to us, however, to be sufficiently distinct as a species, especially as it does not lose its wild features when cultivated. It is altogether a large plant, more hardy, and distinguished by other important differences.

PÆONIA HYBRIDA.

Hybrid Pæony.

Polyandria Tri-pentagynia.—Jussieu.

Ranunculaceæ.—Linn.

P. *hybrida*; herbacea, folliculis recurvatis pubescentibus, foliis multipartitis: laciniis linearibus acuminatis glabris, flore cernuo foliis longiore.

P. hybrida. *Pall. fl. ross.* 2. *p.* 94. *t.* 86. *Willd. sp. pl.* 2. 1223. *Ait. Kew. ed.* 2. 3. 316. *Smith in Rees, in loco, no.* 10. *Decand. syst.* 1. 393; *prodr.* 1. 66. *Bieb. fl. taur. cauc.* 2. 11. *et* 3. 367.

This is the most beautiful of the cut-leaved Pæonies, from all which it differs strikingly in the deeper red of its flowers.

Within a few years roots have been obtained from several quarters, and the study of them in a growing state has now made it evident that it is a genuine species. At least we have high authority for saying that the characters which can be certainly depended upon in distinguishing P. hybrida from P. tenuifolia, are, firstly, the nodding flower of the former, as contrasted with the erect flower of the latter; secondly, the greater length of the peduncle, by which the flower of P. hybrida is elevated distinctly above the leaves, while that of P. tenuifolia is always overtopped by them; and, lastly, in the greater breadth of the leaves of P. hybrida. From P. anomala it is readily separated by its downy, not smooth, fruit.

HAMELIA VENTRICOSA.

Pentandria Monogynia.—Linn.

Rubiaceæ.—Jussieu.

Hamelia Linn.—*Calyx* parvus, 5-fidus. *Corolla* tubulosa oblonga, 5-gona, limbo 5-fido. *Stamina* 5, medio tubi inserta; *antheræ* oblongæ. *Stigma* obtusum, sub-5-gonum. *Bacca* ovata, sulcata, apice retusa et coronata, 5-locularis, polysperma, seminibus minutis.——Frutices; folia *plerumque* 3, *verticillata*; flores *corymboso-cymosi terminalis.*—*Juss. mem. mus.* 3. 398.

Branches smooth, somewhat 4-cornered. *Leaves* lanceolate, membranous, stalked, quite smooth, inserted in threes or fours; *stipules* subulate. *Corymbs* terminal, spreading, smooth. *Calyx* roundish, 5-toothed, *Corolla* yellow, funnel-shaped, ventricose, gibbous at the base, with an erect, plaited, 5-cleft limb. *Anthers* linear, usually projecting.

A handsome hot-house plant, growing vigorously, and flowering in abundance in nearly all the summer months. It is a native of Jamaica, where it becomes a large tree, yielding handsome variegated planks, called by the cabinet-makers Spanish Elm or King-wood.

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1. Campanula glomerata.

2. Buphthalmum grandiflorum.

3. Dianthus deltoides

4. Spiræa trifoliata.

9. Cytisus multiflorus.

10. Canavalia bonariensis.

11. Salvia involucrata.

12. Cratægus heterophylla.

5 Primula cortusoides.

6. Phyteuma orbiculare.

7 Scutellaria columnæ.

8 Chrysanthemum coronarium

ON THE NATURAL SYSTEM OF BOTANY.

Concluded from p. 150.

MANY attempts have been made to arrange the vegetable kingdom according to a natural system of classification; but Jussieu was the first to develope its true principles and construct its foundations and frame-work, to be enlarged and completed by the labours and superior knowledge of succeeding botanists. Considering the immense researches that were required to bring the undertaking to any thing like a finished condition, and the disadvantages which naturalists of those days laboured under, we have more reason to be surprised at its excellence than its imperfections, and feel constrained to look on it as one of the noblest monuments ever erected by human industry and genius in the great temple of nature. Many and important as are the changes it has suffered since its commencement, the impress of its original author is visible at every step, and time has not withered a single laurel that has been placed upon his brows. The fundamental principle of his system is, that all the organs, and likewise all the points of view under which they may be considered, have not an equal degree of importance or permanence; that some control the others and necessarily determine their relations. It is this principle of the subordination of characters, first distinctly set forth by Jussieu, and now applied in the classification of every department of natural history, which drew from Cuvier the splendid and merited eulogium, 'that in the sciences of observation it created an epoch as important as the chemistry of Lavoisier in the sciences of experiment.' To the development of this great idea the labours of botanists have been principally directed, in their endeavours to bring the natural method to the highest possible degree of perfection; and though genius and devotion have been brought to the work in no stinted measure, yet to Decandolle we believe is assigned the palm of undisputed pre-eminence. His *Théorie Elémentaire de la Botanique*, which contains a masterly exposition of the principles of natural classification, is the noblest contribution ever made to the Philosophy of Botany, and justly entitles its author to a place among the Newtons and Galileos of science. It is the production of a mind that could dwell with minuteness on the smallest details, without narrowing its range, and raise itself to the contemplation of the newest and boldest truths, without risk of yielding to the allurements of baseless hypothesis. If we are sometimes startled at the wonderful boldness and originality of his views, we are no less surprised, as we follow him in his course, to behold the caution and security with which every step to their attainment is effected, and are obliged to acknowledge in his reasonings the power of that logic of facts, in which no flaw nor sophistry can be detected. Ever treading on the utmost verge of truth, he never oversteps its confines to lose himself in the bewildering regions of theoretical speculation. His reasonings, though eminently acute and profound, are characterized by a remarkable simplicity, and, presenting a noble specimen of philosophical induction, they proclaim their author a worthy disciple of the school of Bacon. Few are the naturalists, of whatever age or experience, to whom the pages of this work will not furnish, through life, inexhaustible materials for study and reflection. As it is little known, however, and as little studied, we suspect, in England, we have thought we might do an acceptable service to such of our readers as are interested in Natural History, by presenting them not exactly an abridgment of its contents, but an analysis of its general principles.

The theory of natural classification consists essentially of three parts, which treat respectively of the comparative importance of the organs of plants, of the circumstances that may deceive the observer as to their true nature, and of the importance of each point of view under which an organ may be considered.

I. *Comparison of organs.*—In order to ascertain the relative importance of the organs, it is necessary to compare them in reference to their functions. We say, for instance, that the brain holds a higher rank than the nerves, and the heart than the veins, but this does not decide the relative rank of the brain and heart. Or, to adduce an illustration of a different kind, a general is higher than a captain, and a governor of a province than the mayor of a town, but the arbitrary laws of etiquette alone decide whether the general or governor be entitled to precedence. The first general principle in the classification of organized beings is, that the importance of each organ can be calculated only when compared with those organs which relate to the same class of functions. In the vegetable organization there are two classes of functions, one destined to the preservation of the individual, the other to that of the species. These no doubt are of equal importance, and always possessed corresponding degrees of perfection. Hence, we deduce another general principle of classification, viz. that systems, established upon either of these two grand classes of functions, would be equally natural, provided they were constructed with the same care. The preference, indeed, has been usually given to the reproductive organs, because differences in the vegetable organization are more perceptible in them than in the nutritive organs, and more especially too, because the latter have been comparatively but little studied. Were they both equally well understood, without doubt a system founded on one would be identical with one established on the other; for every thing leads us to believe that any complication, or other modification in one class of functions, is attended by a similar one in the other. Cesalpinas had established certain classes upon the structure of the embryo alone, many centuries before Desfontaines was conducted to the same result by making use of the nutritive organs. Hence also we make the division of plants into Monocotyledons and Dicotyledons with so much the more confidence, because we are equally led to it, whether we assume as the basis of our reasonings the reproductive or nutritive organs. In order to estimate the importance of each organ in a given function, we must ascertain what is essential to its performance, when reduced to its simplest conditions. Thus, the essential part of reproduction is fecundation, and the fecundating organs are consequently of higher importance than all their envelopes. At first, the sexual organs are equally indispensable, but the duty of the male part is of short continuance, and they, together with a portion of the female parts, are destroyed after fecundation. But as the female organ, beside this short-lived part, includes another for which all the rest are constructed, its importance is obviously greater than that of the male. Again: in the part of the female organ that remains, the integuments or fruit may be separated from the seed, and exist but for it. The seed has thus a higher value than its envelopes; and continuing the same reasoning, we at last find the embryo performing the most important part in the whole function of reproduction. If, now, our conclusions be just, the organs may be arranged, in regard to their relative importance, in the following order. 1. The embryo, the great end of all the rest. 2. The sexual organs, which are only the means. 3. The envelopes of the embryo, viz. the integuments of the seed and the pericarp. 4. The envelopes of the sexual organs, viz. the corolla, calyx and involucre. 5. The nectaries and other accessory organs.

Another means of judging of the relative importance of organs, is by the degree of constancy with which they appear in the vegetable organization. Some, we know, are frequently absent, some not so often, while others are almost always present. Hence we infer, that the stamens and pistils have a higher rank than the calyx and corolla, and these latter than the nectaries; the filaments of the stamen and pistil are thus shown to be of less consequence than the anthers and stigmas.

A third means of judging is, to observe to what point a given organ is more or less intimately connected with the structure of certain groups, already acknowledged by naturalists. Thus, we conclude that stipules are more important than spines, because a great number of families either have or have not

stipules, while there are many in which we find indifferently species with or without spines.

II. *The circumstances that may deceive the observer as to the true nature of the organs.*—Before we can decide any question as to the relative importance of the organs, we need some means of distinguishing the organs themselves, and recognising their true nature, under all the modifications they are liable to experience. Looking at a single organ abstracted from the general structure, we can judge of its nature solely by its use, whatever may be its position, form, or mode of action; thus, the organ of vision is called the eye, and the part that bears the flower is called the peduncle. But when we examine beings as a whole, and judge of the nature of the organs in reference to the symmetrical plan on which they are constructed, this method will lead us into grievous errors. The tail of the kangaroo serves the animal as a leg, yet nobody denies that it is still a tail: the nose of the elephant, prolonged to a great length, performs the office of a true hand; and the teeth implanted in the incisive bone serve a purpose entirely foreign to mastication, yet none pretend to dispute the anatomical analogy of these organs with the nose and teeth of other mammifers. So too, we see the leaves of plants sometimes prolonged and changed into tendrils, for the purpose of supporting the stem, though their primitive function is to elaborate the nutritious juices. The stipules, the peduncles, and even the lobes of the corolla may be converted to the same use, and every body is familiar with the leafy appearance and structure of the branches of the Indian Fig, or Prickly Pear, *(Cactus Opuntia)*. From these examples, and a host more that we might mention, we deduce the general conclusion, that it frequently happens, in consequence of a given system of structure, that a certain function, not being sufficiently performed by the organ ordinarily allotted to it, is discharged wholly or in part by another. It is this system of organization, this symmetry of the organs as compared with one another, of which a knowledge is essentially necessary to a perception of the general harmony and natural classification of beings. This symmetry of parts, which should be a prominent object of the naturalist's studies, is, in one word, the result of their relative disposition; and therefore, whenever this disposition is the same, no matter how various may be the form of particular organs in other respects, the subjects present a kind of general resemblance, that strikes the least practised eye.

Among the causes of error that are liable to mislead us in ascertaining the true nature of the organs, the principal is *abortion*, more or less complete, which alters their symmetry. Every body knows, that sometimes certain parts of organized beings do not receive that increase and development for which they were evidently destined, owing either to the compression of a foreign body, or a loss of part of their nourishment. This effect may be produced by internal causes, such as *caries*, for instance, as well as external; but among those which prevent certain organs from receiving their full increase, it is possible that some may be the necessary consequences of the growth of another part, and will, of course, constantly occur in a given system of organization. We may, therefore, admit in theory the constant and predisposed abortion of certain organs, either wholly or in part. This is a startling doctrine to those yet uninitiated into a knowledge of the more hidden laws of organization, but is, nevertheless, as easy of proof as an abundance of the clearest facts can make it. Whoever will take the trouble to cut across the ovary of a horse-chesnut flower, soon after the petals have fallen, will find three cells and two seeds in each cell; but let him look a few weeks afterwards, when the fruit has attained its perfect growth, and three seeds or nuts are the most that can ever be found—sometimes but one. But to remove all doubt as to the fact and nature of this phenomenon, we have only to cut open an ovary every day after the period of flowering, to see some of the seeds gradually increasing, while the others are observed to remain stationary, and finally to be completely choked by the development of the first. Now, when we bear in mind that this phenomenon is constant, and takes place in trees perfectly sound, are we not forced to believe that it is owing to some circumstance in the very system of the organizaton of this tree? In the oak, too, we have another familiar instance of a three-celled and six-seeded ovary finally resulting in one perfect seed only. The disappearance of the sexual organs is a very common occurrence, of which an example may be witnessed in the marginal florets of the snow-ball genus, and many other plants whose flowers grow together in large masses. The question then recurs, how shall we recognise the general symmetry of plants, amid the confusion produced by these partial abortions? Some light may be obtained on this point from observing appearances denominated *monstrous*—an epithet commonly given to all such as differ from the habitual state of the organs, though many of them are returns of nature to the symmetrical order. Thus, to recur to an example already cited, if, by some accidental cause, the six little seeds of the horse-chesnut or oak should obtain their full growth, and present us with a fruit of six nuts or acorns, we should call it monstrous, while, in truth, it is the single-seeded fruit that is the real monster. The Antirrhinum or Toad-flax has a personate corolla, the lower segment of which sends out a long spur, with four stamens of unequal length, and the rudiment of a fifth. In a variety of this plant called Peloria, the flower is perfectly regular, having an equal five-lobed corolla sending out five equidistant spurs, in which are five equal stamens. Here is a most singular case of a return of nature to her favourite symmetry, and no doubt can be left as to which is the real monster. The rare example of certain compound flowers, where we see the egret become leafy and assume the appearance of a true calyx, is a strong proof of the egret's being, in fact, an abortive calyx. It is well known also, that trees which have spinous branches in a dry soil, cease to have them in a fertile one—a sufficient proof that spines are abortive branches.

Another guide, less sure perhaps, but adapted to more general use, is analogy or induction. It is found solely in a knowledge of the respective positions of organs. In an Albuca, for instance, we find the entire structure of a liliaceous plant, excepting that it has only three stamens bearing anthers, while between them we observe three filaments placed precisely where stamens would be, and very similar to the existing stamens. Hence, we conclude that these filaments are abortive stamens. In the Ice-plant (Mesembryanthemum), we find a great number of filaments disposed in several ranks, but all adhering by their bases, and attached to the same point of the calyx, the interior bearing fertile anthers, the middle having the anthers wholly or in part abortive, and the exterior being true petals. We conclude, then, that in this genus the petals are naturally abortive stamens, and from a crowd of similar facts we are led by a very powerful analogy to the belief that the petals of all plants, as a general theorem, are only filaments of stamens, whose developement is in the relation of cause or effect to the abortion of the anther. When too we see the calyx of a Valerian or Scabious, evidently assuming the form of an egret or pappus, we are induced by analogy to extend this result to the compound flowers, and conclude that *their* pappus is only an abortive calyx. Finally, by analogy alone, we judge in a host of cases of the natural number of the parts of flowers and fruits, and are led to look carefully for those whose abortion we suspect. It is the successful use of this principle which, more than any thing else, facilitates the study of nature, while the number of its objects are daily increased by discoveries, and constitute in fact the true genius for Natural History.

The proximate cause of abortion is principally defect or excess of nourishment, and it may be well to consider a little farther the operation of these causes; and first, the effect of abortion by defect on the organ itself. When partial, it gives rise to inequalities between organs naturally similar, and this is the principal if not the only cause of the irregularities presented in the structure of vegetables. Every thing which has any bearing on this subject goes to establish the conclusion,

that all organized beings are regular in their intimate nature, and that abortions, variously combined, produce all the irregularities that arrest our observation. In this point of view, the slightest inequalities between organs of the same name in a plant, are important, because they tell us in language plainer than words, that we may find analogous plants where this inequality is still greater, and others where these organs, thus subject to partial abortion, have entirely disappeared. It may be received as a general principle, that wherever, in any given system of organization, there is inequality between organs of the same name, this inequality may attain its maximum, viz. the annihilation of the smallest part. When the abortion of an organ has proceeded so far as to prevent it from discharging its functions, it may be enabled, by this very circumstance, to fulfil some other functions. The abortion of the extremity of the leaf in vetches renders this part capable of performing the functions of a tendril, and abortion of the flowers of the Vine turns the peduncle to a similar use. In the same way, branches are changed into spines, and serve as defences to the plant, and the calyx of compound flowers into a pappus, which is useful, not more to the protection of the sexual organs, than the dispersion of the seed. It may happen, however, that an abortive organ, having lost the power of performing its proper function, never becomes adapted to any other, and remains without any manner of utility in the plant. In a multitude of vegetables, we find abortive stamens and pistils reduced to simple filaments or stumps, and evidently useless. Petals are sometimes found so small that they can hardly be discovered, and cannot protect the sexual organs. What purpose can those florets of certain compound flowers serve, which are invariably sterile? In the animal kingdom, the nipples of males, the rudiments of clavicles in the Cats, and of digits in the Rumioants, present us instances of a similar kind. These useless parts are the result of the primitive symmetry of the organization, and so far is their existence from being an argument against the general order of nature, that it furnishes one of the most striking demonstrations in its favour.

Finally, abortion may be so complete as to leave no trace whatever of the organ. Sometimes, it may be discovered, as in the seed of the oak, in the earliest periods of its existence, and observed to be gradually diminishing, while, in other cases, the organ is never found in any stage of growth. Here, abortion is determined by causes so remote, that it is completed before it could be visible to us, although it may nevertheless have once existed. To illustrate this idea, let us suppose a branch of a palm, cut open from top to bottom, and our attention directed to the bunch or cluster in the centre of the section near the top, which is destined to expand the following year, then, a little lower down to the one that is to expand the second year, below that to one of the third year, and so on till we arrive at that which will expand seven years hence. Now, in certain palms, there is an entire abortion of some parts of the flower, and though this part may never be visible when the flower is developed, yet no one can deny that it may have existed in the bunch of the proximate year, or in one of the following, and that with the aid of proper instruments we might have discovered it. These abortions, like others, may be accidental or natural: when the former, we may observe the part uaffected hy abortion in other individuals of the same species; when natural, predisposed as it were by the march of vegetation, we recognise the abortion only by the analogy of neighbouring species. The effects of abortion on other organs will differ according to the degree to which it is carried. If it he considerable, or if the nourishment be thrown upon organs of a more variable nature there results, not only a change of size, but of function. In double flowers, which present a remarkable example of this kind, the abortion of the anthers permits the filaments to be developed beyond measure, and become transformed into veritable petals. All that has been said of abortions by defect is equally true of abortions by excess, but in an inverse sense; and thus, while one necessarily produces the other, and both exist together, it is impossible in most cases to determine which is the cause, and which the effect. Resuming now the immediate consequences of this theory of abortion, we see in it, first, an explanation of a multitude of anomalies in the number of the parts of plants; secondly, of many, perhaps all, the inequalities of proportion in similar parts; thirdly, of the changes of form, and consequently of use, so frequent in organization, and incomprehensible without this theory.

The next source of error to be considered, is the *adhesion* or *engrafting* of organs. Every body knows that a bud or shoot, placed upon another tree under certain conditions, is united to it in such a manner as to form a part of it, and grow as if it were on its own stem. Every body knows, too, that in forests we find trees of the same or analogous species, which having been accidentally approximated, are united together so as to form but one trunk; and many have observed that certain organs of plants, that have been brought near one another, are united in a most intimate manner; that two neighbouring flowers may be so united as to form but one, having a double number of parts, and that two leaves may also adhere together, so as to form but one of a singular shape. So long as these adhesions take place rarely, they are considered, and justly too, as simple accidents, and no importance is attached to them in classification. But let us suppose that two ovaries, for instance, stand very close to each other from their origin, as in the case of the Pigeon-berry, (Mitchella Repens); it is clear, that by reason of this approximation, the opportunity of coalescing is so great, that union will always take place, and we shall never see them separate. Now, this adhesion is nothing more than an *accident*, but it is one which is determined by causes belonging to organization, and as constant as the organ itself, insomuch that we have what may be called a constant accident, and though these terms seem contradictory, this kind of phenomenon is still very common in nature.

Not only may similar organs be primarily disposed in such a manner as not to be able to grow without adhering together, but the same thing takes place in different organs; and it is remarkable, that while this phenomenon has been recognised under certain circumstances, it has, in analogous cases, been entirely overlooked or denied. Any organ, a calyx or corolla, for instance, may be described in two ways; either analytically, by considering it as an unique whole divided into parts more or less distinct, or synthetically, as an aggregate of parts essentially distinct, but more or less approximated or united. In the first method, we are bound to render an explanation of the causes and laws of the separation of the parts; in the second, to give a similar explanation as to their approximation or union. Both methods involve some hypothetical considerations, and yet, we must follow one or the other. If we are describing a Hollyhock, we must either regard the corolla as an unique whole, divided into several portions called petals, or the petals as distinct organs, which by their union form the corolla. Each of these modes of reasoning may possibly have some good foundation, but certainly it cannot be right to adopt one in the case of the Hollyhock, and the other when treating of a different flower. We must be consistent, and a method being once admitted, it must be adhered to in all analogous cases. The phenomena of crystallization, to borrow an illustration from a neighbouring science, were explained by Rome de l'Isle, by considering crystals as integral bodies, which, in consequence of different truncations, assume all the secondary forms. The Abbé Hauy, on the contrary, explained the same facts by supposing primitive molecules, which, aggregating after particular laws, determine all the secondary forms. Either theory may be adopted, though the former is now abandoned; but what would be thought of a mineralogist, who should describe one crystal after Rome de l'Isle's method, and another, after Hauy's? And yet, such is the state of botany, that this is constantly done in regard to that science. It becomes, therefore, a matter of serious inquiry, which of these two methods best expresses the whole of the facts, and whether there be

cases where they may be blended together. When we speak of the perfoliated leaves of the Honeysuckle, the idea meant to be conveyed is, that an unique or orbicular leaf is traversed or enfiladed by the stem that bears it, yet no one at the present day hesitates to consider this pretended perfoliated leaf as composed of two opposite leaves united at their base. In precisely similar cases we use the term *connate* leaves, which expresses nearly enough the idea of union; we follow all its degrees from the slightest to the most intimate kind, and when we perceive an interval towards the point of junction, we still consider it as two leaves imperfectly united, not as an unique leaf deeply gashed. The reason is, that at the base of the plant the two opposite leaves are separate and distinct, and that as we approach the summit, they tend more and more to be united; that we find each half of the perfoliate leaf unique in appearance, and possessing all the organization of one of the inferior leaves. Thus, though the phenomenon is constant, no one hesitates to consider it as a kind of accident, determined by the organization itself.

The law here recognised is applicable to every case of connate leaves, and we must admit the general conclusion, that as leaves may adhere together accidentally, there are cases in which this phenomenon occurs constantly, in consequence of their nature and position. All that has been said of leaves must be readily admitted of stipules, which resemble them so closely; so that when we see all the Leguminosae having a stipule on each side of the petiole, we may conceive that, if these two stipules should be so large as to touch on the side farthest from the petiole, they might be united, and consequently assume the appearance of an unique stipule opposite the leaf. The involucres, too, are subject to the same law of adhesion, as might readily be supposed from analogy, since these organs are now universally regarded as only assemblages of floral leaves. In the Umbelliferae, the involucre generally consists of a certain number of whorled and separate leaflets, but in some species of this order, there is found, instead of this whorl, a leafy disk, presenting as many teeth and furrows as there are leaflets in the neighbouring species. We are therefore constrained to regard this disk as formed by the natural union, more or less complete, of many leaflets, and not as a single-leaved involucre. If then, the leaves and involucres be so readily regarded as subject to this law of adhesion—of the union of several distinct parts into one—why should not the fact of its operation be admitted in regard to the calyx? This organ resembles the involucre in every respect; the anatomy of the sepals shows that they are entirely leafy organs; they are green and decompose carbonic acid like the leaves; they are almost always furnished with the same hairs, glands, and sacks as the true leaves, and, finally, in a multitude of cases, accidental or habitual, we see them developed into true leaves. If then the calyx is of a leafy nature, and so very analogous to the involucre, why describe it on a diametrically opposite plan? Why consider it as a unique organ, more or less divided, instead of saying, as in the preceding cases, that it is formed of pieces more or less united together? Besides, the latter method involves no more hypothesis than the former; since, in a very considerable number of plants the sepals are completely distinct from one another, and even attached separately to the peduncles. It is best supported too by their anatomy, for all the nerves of the calyx are directed from the base to the summit, as in leaves, though constantly described as if they proceeded from the summit to the base; and since all modern botanists admit the union of the calyx to the ovary, it would be strangely inconsistent to imagine that the sepals could not be united as easily to one another as to a foreign organ. Instead of saying of a calyx, that it is deeply cleft, the most proper language obviously is, that the sepals are united only at the base; instead of describing it as lobed and toothed, the sepals should be considered as united half or more of their length; instead of distinguishing calices into polysepalous and monosepalous, we are bound to use the distinctions of polysepalous, or free sepals, and gamasepalous, or sepals more or less united, and reserve the term monosepalous for the rare cases, where there really exists but one lateral sepal.

The same reasoning, the same analogies are applicable, with perhaps still greater force, to the operation of the same law upon the corolla. This is not an unique whole, more or less divided, any more than the calyx, but an assemblage or whorl of petals, sometimes perfectly free, and sometimes more or less united. In many cases this union is in a manner manifest to the eye, while in others it is indicated by the disposition of the vessels; where it is not thus visible, and the tubes are continuous, it may be conjectured by analogy, and by the insensible gradations to be observed between corollas with petals entirely free, and those with petals united. The corolla of the clover is formed of but one piece, instead of four separate and distinct petals, as in all the rest of the Leguminosae; yet who, on that account, would deny its analogy to that order, and that it differs only in the natural adhesion of its petals? Adopting the ordinary way of distinguishing corollas into monopetalous and polypetalous, we must suppose an organization entirely different; for what analogy is there between a flat petal associated with several others in a whorl, each attached to a single point, and a circular tubular petal, with many points of attachment and a sinuated margin? Such a fact can be considered as hardly possible, when we recollect how many families there are, in which we see plants with monopetalous and polypetalous corollas, indiscriminately mingled together. And what are we to make of those corollas whose pieces, as in the vine, are separate at their base, but united at the summit? This reasoning becomes still more striking, when we consider the light in which stamens have been viewed. These parts possess an extraordinary analogy to petals; their point of attachment is constantly the same; their number and position are generally symmetrical; the anatomy and physiology of the filament of the stamen is perfectly similar to that of the claws of the petals, and in some flowers, they pass into each other by such insensible gradations, that it is impossible to say where one begins and the other ends. This being the case, we ought certainly to expect that the same mode of reasoning, in regard to the adhesion of one, should be equally applicable to that of the other. Now, however much the stamens may be united together, they never are considered in the light of an unique organ, divided more or less deeply into several parts, but always as separate and distinct organs, united according to the law of adhesion. But is this union of the filaments any more apparent than that of the petals? Are not the two phenomena equally constant in the same species? Are any more evident traces of it left in one than in the other? These two organs are of the same nature, and we must either consider the whorl of stamens as an unique whole, deeply cleft, or the whorl of petals as formed of many pieces more or less united. What would be thought of a zoologist who should describe the feet of the web-footed birds as orbicular disks, divided to a greater or less extent? All naturalists regard them as distinct digits, united by a membrane, and this manner of considering organs as compound bodies, is the only one that represents the natural state of things,—the only one that admits of clear expressions and exact comparisons.

The truth of this theory becomes still more manifest, when we attend to the manner in which petals adhere at their base. In a polypetalous flower we see that generally each petal is fixed at its base by a fibre which carries its nourishment, and that if its base be very large, the rest adheres only by cellular tissue. Every family has thus a certain disposition in the vessels of the petals, and it is always the same, whether they be united or not. This analogy is equally striking, when considered in another point of view. Petals are composed generally of a claw and limb, as stamens are of filament and anther, and adhesion ordinarily takes place by beginning at the base and finishing at the upper part, so that most petals, when they unite, adhere by their claws, while the limb is free. In the same manner, most adhering stamens have the filaments joined and the anthers distinct.

We come now to the pistil, or what, in this relation, is the same thing, the fruit. In the Ranunculaceae, we generally find the fruit composed of a considerable number of partial carpels, united, in some species, only at their base, in others half their length, in others, nearly to their summit. Hence, no conclusion can be more natural than that ovaries, apparently unique, but divided internally into many cells, are in reality formed by the constant and natural adhesion of many carpels, Sometimes the partitions between the cells are formed by the re-entering valves, the carpels being plainly united by their lateral faces—a fact which beautifully illustrates this theory. We would say more on this point, but as it would be difficult to render our language intelligible to any but practical botanists, we are reluctantly obliged to dismiss thus briefly the most interesting among all the discussions on this subject.

If the above reasoning be correct, it appears that the adhesion of different organs takes place as a necessary consequence of primitive contiguity, constituting what is called *predisposed adhesion*. It is easily conceived that it may mislead us in regard to the number, position and nature of the organs, and that it constitutes a subject of considerable importance in classification. Every case of adhesion cannot be of equal consequence, and we are therefore led to adopt the following general rules for guiding our inquiries on this point. First, the adhesion of the different organs of fructification is so much the more important, as it takes place between parts in which this operation is most difficult. Secondly, the adhesion of these organs is so much the more important, as it is necessarily connected with the greatest changes in the general symmetry. Thus, the union of the petals and stamens, of the filaments and styles, of the anthers and stigmas, of the ovary and calyx, in consequence of the great anatomical similarity of these parts, are phenomena of easy and frequent occurrence, and therefore of no great importance; while, for the very opposite reason, the union of the corolla and calyx, of the stamens and calyx, of the corolla and ovary, must be regarded as instances of adhesion of the highest importance.

We are not to suppose, however, that whenever two organs adhere together, they necessarily preserve all the parts of which they were originally composed. When two labiate flowers are united, we rarely find eight stamens, but seven, six, or only five, and instead of ten lobes, their corolla may present indifferently all the numbers between five and ten. In fact, the union of two regular flowers is seldom recognisable except by an augmentation of the number of their parts, some of each being lost by abortion. This theoretical consideration may be applied, in many cases, for the purpose of recognising the affinities of certain plants. The Cruciferae, for example, have naturally four petals and six stamens, which inequality in the number of parts, indicating a loss of the original symmetry of the flower, we wish to determine whether they are related to plants whose number of stamens is double that of the petals, or to those where these numbers are equal. If to the former, we must suppose them in their primitive state to have had eight stamens, two of which have aborted; if to the latter, that each flower is originally composed of four petals and four stamens, but that they grow in threes, and that there is a union of the three flowers, with an abortion of the lateral ones, excepting a single stamen in each. This latter hypothesis implies a more complicated operation than the former, but still appears to approach nearer the truth; for cases have been found where the flowers possessed four petals and four stamens, and where, in place of the two lateral stamens, there was on each side a flower with the same number of parts. We are still farther confirmed in the belief that this is the primitive state of the Cruciferae, because the position of the two lateral stamens is always below that of the others, because they are very constantly wanting in many species, and because the Hypecoum, the only genus with which the Cruciferae have any marked relation, has four stamens and four petals. This single case must suffice to show the practical application of the theory of abortion and adhesion, in unravelling the natural affinities of plants.

III. Having now exposed the principal difficulties in the way of recognising the symmetry of the organs, we shall show very briefly in what this symmetry and the comparative value of its elements consist. The most important of these elements is the existence or absence of organs; and on this point we must beware of some powerful causes of error. Two organs really existing may be so united and assume such an appearance, that the presence of one becomes problematical. Thus, the union of the calyx and corolla has given rise to the idea that one or the other of these organs is wanting in plants, where both really exist, and the union of the pericarp and spermoderm has sometimes induced the belief that the seeds had no proper envelope, or that the pericarp was wanting. Certain organs may fail also, in consequence of abortion; and it is only by means of an acquaintance with the general symmetry of the plant, that we can distinguish between this phenomenon and that where the organ is naturally wanting.

After the presence or absence of organs, the next most important element of their symmetry is their absolute and relative position; for here we expect the greatest and most permanent difference. The essential position of a particular organ must be determined in relation to that which serves as its real support, that is, from which it receives its origin and nourishment, and not organs foreign to its existence. This it is frequently very difficult to recognise, but their relative position, though less important, may be oftener and more surely employed. In all vascular vegetables, which comprise all with whose symmetry we are acquainted, we remark that their organs are placed relatively to one another in a general order. In the flower, the pistil occupies the centre, and the stamens, petals, and sepals, composed of a certain number of parts, are disposed around the pistil according to different symmetries. They may be placed directly before or alternate with one another; they may correspond with the parts of the pericarp, or have no relation whatever with them. These different combinations possess considerable importance in classification, provided that we avoid the two sources of error already exposed, adhesion and abortion, which by diminishing the number of the parts, conceal their true symmetry. Thus, it belongs to the symmetry of the Leguminosae to have the petals alternate with the sepals, but if the two inferior petals be united, or if one of the petals prove abortive, the number is reduced, and the symmetry is masked to the eyes of the superficial observer.

The absolute or relative number of organs is a character whose importance has been very differently estimated, but which, like many others, varies under different circumstances. The absolute number of organs is liable to be modified by a variety of causes, such as abortion, adhesion, &c.; but where all these sources of error are avoided, we cannot deny that this character is one of considerable importance, though subject to certain conditions. We may say, first, that the absolute number of organs in every plant is generally more fixed, and consequently so much the more important, the smaller that number is; secondly, that unity never exists naturally in any of the reproductive organs, except the pistil,—whenever they are found single, it is the consequence of abortion or adhesion,—and in the conservative organs, unity of the leaves exists only in the Monocotyledons; thirdly, to ascertain the true absolute number of organs in a plant, it is necessary to go back, by means of the theory of abortion and adhesion, to the number that appears to be the primitive type of the class, or to one of its multiples. The numbers 4, 5, and their multiples, seem to belong to the Dicotyledons, and 3, with its multiples, to the Monocotyledons, while 2 and its multiples are very permanent among the Acotyledons. Characters drawn from the relative number of organs, that is, from a comparison of the proportional number of the parts of the different systems of a compound organ, may be relied on with considerable confidence. Thus, the absolute num-

ber of stamens in the Epilobium is 8, the relative number twice that of the petals. Under this point of view, we are obliged to distinguish between *multiple*, *determinate*, and *indeterminate* relations. An instance of the first we have in the Epilobium, where the parts of the calyx are 4, corolla 4, stamens 8, and pistil 4; of the second, in the Violet, where the parts of the flower are as 5 to 3 compared to those of the pistil; of the last, in the Magnolias, where the number is not fixed in the petals, stamens, or pistils. If now abortion take place in all the four systems of a flower at once, their relative numbers may remain the same, while their absolute number will be changed; but how are we to distinguish between these two kinds of numbers? If we consider that when a single system is altered, the flower becomes necessarily irregular, and that in all cases, where every system is affected at the same time, it remains regular, we arrive at a simple and exact theorem: viz.—In all regular flowers, the relative number of the parts of each system should be the first object of our research; in all irregular flowers, we begin by ascertaining the absolute number of each system, and thence deduce their relative numbers. When one or more parts of a system are so numerous as to present many ranks, the relations of number, though still existing, are difficult to be perceived, though by care and diligence we may sometimes find them. An oriental Poppy has been observed, which had 3 sepals, 6 petals, and 564 stamens, that is, 94 ranks of 6.

The next element of symmetry to be considered, is the absolute, relative, and proportional size of the parts; and here we may compare together, in regard to size, two systems, or their parts. The proportional dimensions of the parts of a system are frequently a matter of great interest, for the whole study of irregular plants, and consequently, the whole art of referring them to the regular symmetries of which they form a part, rests upon the examination of the inequality of the parts of a system. The fundamental principle of this examination appears to be, that among vascular, and perhaps, among all vegetables, the parts of the same system are naturally of equal size, and become otherwise only in consequence of phenomena more or less intimately connected with the general structure of the plant. The causes of these phenomena we are not always able to specify, but the position of the flower on the stem undoubtedly determines a great many inequalities. When solitary, erect, and terminal, it is equally nourished, and will of course be regular, insomuch that it may be considered as an unexceptionable general law, that flowers thus situated are regular, even when they belong to a family ordinarily irregular. If other flowers spring up around it, forming a head, their equilibrium is disturbed; those in the middle, being equally pressed, will become abortive or change their form, though still continuing regular; the lateral ones, being unequally pressed by their neighbours, will have a tendency to increase on their external side, where the pressure is least. All families with a peculiarly irregular flower, are never observed to have the flowers terminal, always having them axillary, or disposed in a spike or cluster. Sometimes, in the Labiatæ, we find terminal flowers, but then they are always regular. An important result of these considerations is, that since the primitive symmetry of each system may be deranged by accidental causes, it becomes necessary, before we can establish a good classification, to trace back all irregular plants to their primitive and regular types, though these types may be rarely encountered, and sometimes are even ideal. Thus, the Personatae are found to be only alterations from the type of Solanceæ.

We have thus exposed very briefly the principles which determine the comparative importance of organs, and the method whereby we may graduate the degree of importance presented by the different points of view under which each organ may be studied. It is also requisite to show how these two modes of reasoning may be combined, or in other words, how we are to arrive at a proper appreciation of characters: for a character, in fact, is one manner of considering organs generally, applied to one in particular. As a general rule, the value of characters is in a ratio composed of the importance of the organ, and of the point of view under which we may consider it; so that characters, drawn from a particular organ, will have a value proportioned to that of the modification, and when drawn from the modification, it will be proportioned to the importance of the organs. Though the organs have different degrees of relative importance, yet the value of characters drawn from them will depend on the importance of the modification; for a very trivial one in a very important organ may furnish a character of less consequence than a greater in a far less important organ. The results of the combination of these two elements will be equal or unequal. They will be equal, first, when the same modification is common to two organs of the same physiological rank; secondly, when two modifications of the same rank exist in one or two organs of the same rank; thirdly, when the importance of the organ is counterbalanced by that of the modification. Thus, if we compare the sensible qualities of the embryo, the highest of all the organs in the scale of importance, with the existence of the nectary; or in other words, if we compare the least important modification of the most important organ with the most important point of view under which the least important organ can be considered, we shall have two analogous results, as theory and observation both testify.

Here we must close our notice of the Natural System. Though many points have been left untouched, and though we are sensible that general principles must lose much of their force and clearness, when presented without the proper illustrations and discussions; yet, we trust that a more correct idea of the philosophy of botany has been conveyed, than is readily obtained from the books published as peculiarly illustrating it.

HOW TO THICKEN THORN-HEDGES, AND PRODUCE BRANCHES ON TREES.

The object of the experiments related in the following paper, (which we have gathered from the Transactions of the Highland Society of Scotland) was to procure lateral branches from the bare stems of thorns, and other ligneous vegetables; and the result being stated as satisfactory, it is only necessary to explain the manner in which it has been effected. The sap, in circulating or ascending, naturally moves along the bark of a bare stem of an even surface, without any tendency to develope lateral shoots; but the temporary interruption of the course of the sap in thorns, as it is known to do in other plants, seems to give an impulse to inactive germs, by which lateral branches are produced; and therefore, in point of beauty and utility, the discovery is important.

A thorn-hedge, when properly managed, surpasses in appearance and durability any ordinary field fence. But they never succeed in situations where they are exposed to too much moisture or where the soil is arid; and in cold exposed situations their stems become covered with grey lichens, indicative of an unhealthy condition. When such cold soils are not trenched previously to planting, hedges and trees make slow progress, especially where the ground is stiff, and opposes the shooting of the roots. Very light gravelly soils are also unfavourable to the growth of thorns. But the greatest error usually committed in rearing thorn-hedges, is the neglect of keeping them clean and properly trimmed when young, so that at best the hedge becomes as broad as it is high, or looks like a canopy supported by bare sticks, on account of being choked at the root by weeds. No hedge looks so neat or lasts so long as one kept nearly in the form of a stone wall, the proper dimensions being from three to four and a half feet in height, from one to two feet in breadth or thickness at the base, inclining upwards, until at the top its diameter is only a few inches.

But when neglected, as already said, it has hitherto been considered an irreparable evil attendant on thorn hedges, as respects their bushiness at the root, that they are scanty and bare,

and not to be remedied but by cutting the whole close to the ground, and training it anew, which though efficient is a slow style of amendment. On a farm near Stirling a farmer tried a new method of renovating his hedges, where many of the thorn-stems were almost entirely destitute of lateral branches within two feet of the ground. This he accomplished by making horizontal and semicircular incisions in the bark, by which from a quarter to half an inch in breadth of both layers of the bark was removed fully half-way round the stem. In a few weeks after, buds appeared and shot forth, usually close under, but sometimes over the incisions. This simple operation, performed by a hedge-bill or a pocket knife, early in spring, does not seem to injure in the least the thorns, for the cut being clean and not deep, no canker ensues, and it soon closes up again, leaving only a slight scar in the place; care must be taken, however, that no shred of the inner bark remain to continue the circulation. The partial interruption merely causes a lateral exertion in the sap-vessels to overcome the obstruction, and the sap thus accumulated gives rise to the new branches, so that the stem may be cut at two or more places if necessary. The artificial branches seldom failed to appear where the stems were healthy, and have sometimes attained a length of two feet the first season. But as such tender twigs are apt to be hurt by frost, if cut too young, they were not touched till the first or sometimes the second spring after, when such as required it were cut off a few inches from the stem, which caused an immediate subdivision of each branch. Thus, the ragged ill-filled hedges of this gentleman have been continued at the regular height, and at the same time trained into a uniform breadth and thickness, not attainable by any other method, in the same space of time.

Having succeeded so well with the thorns, he tried afterwards an experiment on a few forest trees, about six inches in diameter. The incisions were made about six feet from the ground, and, in some instances, immediately above slight swellings, which indicated a tendency to shoot forth branches. The consequence was, that a new branch sprang forth the same season, from almost every one of the trees. In the thorns, however, no search was made for these eyes, and few or none were observed. The object in these last experiments was to ascertain whether a tree intended to be ornamental, but which had been forced up by close planting to a long pole, might be made to assume a luxuriant appearance, and so far as this gentlemen has proceeded, it appears that his attempt has been followed by the desired effect.

ON IMPROVING THE BLOOM, AND PRESERVING OF CERTAIN FRUITS.

Mr. Robert Gauen, gardener, at Millbrook, near Southampton, some years ago published a method of improving the bloom of certain fruits, which is worthy of the notice of those who have an interest in ornamenting, preserving, and packing such articles, and to which we beg to renew attention. Ten years' experience, and the award of many prizes for show fruits, have conferred on Mr. Gauen singular skill in this branch. The delicate bloom of the cucumber, its length, girth, and straightness, are, as is well known, important considerations among florists and growers of prize fruits. For these purposes the cucumber must be protected from the drip of the lights, from the period of its blossoming, and from the damp of the soil, by two pieces of glass, about four inches wide, and from eight to a dozen long; the one placed under the fruit, and the other supported on pegs over it; both having a slope to one end, to carry off any condensed damp.

To procure the straightness of a gun-barrel, a slender and lengthy form for the cucumber, instead of supporting the upper glass on pegs, lay on the under glass, alongside the young fruit, two pieces of wood about the length you suppose the cucumber may grow to, about two inches square, and with the upper inner angle of each piece bevelled off. The solar heat is increased by these pieces of wood throughout the day, and by close confinement during the night, the fruit is conducted to considerably more than its natural length. This mode of securing elongation is attended with small prickles placed at greater distances than is desirable in a handsome specimen.

To ensure shape, size, prickles, and bloom, the foliage of the plant must be kept moderately thin. Never wet the fruit in watering the plants. Before cutting it, be careful that it is perfectly straight, at least a day previously, for this operation can never be so well conducted as when the fruit is on the plant. In straightening warped fruit after it is cut, let it be kept in a cool, dry place, and excluded from the change of air. Mr. Gauen merely kept them in their show-box, in a cool, dry room.

His straightening process is thus:—Take a flat board, half an inch thick, four inches broad, and the length of the cucumber; bore holes at intervals of half an inch across the board, and within one inch of each end. Provide two strips the length of the board, one half inch wide and one fourth inch thick; place one strip on edge, supported by a peg placed in one of the holes outside the strip that is on edge, and put the board under the growing fruit, with the two ends of the arc formed by the crooked fruit against the upright strip; place a bit of cotton-wool or moss between each end of the fruit and the upright strip, to prevent bruising. Then take the other strip and bring it within a peg placed at one end, with a bit of wool or moss placed against the outer arc of the crooked fruit, as before. Proceed to straighten the fruit with one hand, straining it by the strip (keeping the whole steady with the other) towards the fixed upright strip, so as to bring it in a straight direction, and fix another peg. In ordinary cases the cucumber may be made perfectly straight at the first operation; but in some instances it requires two or three. A fruit may be straightened at any period of its growth, but it requires to be left one night under training, after the operation, to prevent its return to crookedness.

The bloom of the fruits, which suffers by this operation, may be restored; which Mr. Guaen accomplishes by the use of a box with sliding and false bottoms, a common powder-puff and some finely calcined and perfectly dry magnesia. In packing, if there are more tiers of cucumbers than one, they must be kept apart by these false bottoms being supported so as not to injure the subjacent fruit.

To preserve bloom on the grapes, complete the thinning of the berries when they have gained half their size, and do not dash water violently against them or subject them to a current of steam. Abundance of sun and air are favourable for the production of bloom, neither will a moderate degree of shade injure them. When grapes with delicate bloom are gathered, they should be placed in a basket of well threshed moss, taking care not to bruise any of the berries. To restore the bloom to them, work the puff at intervals of an hour or two, in the blooming box.

Grapes require more care in packing than any other species of fruit. Mr. Gauen recommends moss and cotton wool, the former well threshed and picked; place a layer of moss at the bottom of the box; on this a layer of cotton-wool; and next, the bunches, side by side, within half an inch of each other; fill the interstices with cotton-wool, place a layer of the same material over the fruit, and finish with moss. A false bottom, supported by the sides of the box, may next be introduced, and the operations repeated. When the bunches are very large, it is necessary to interpose splints of whalebone through the heavier parts of the bunches, to support them on the sides of the box, or on the interstices of cotton-wool.

Of grapes, it may in general be said, that the berries of the best flavour and colour are those of the first ripened bunches (of the bunches at the root end of the vine), and of the lower extremity of the bunch. Unlike many other fruits, they do not improve in flavour after gathering, and unripe bunches do not become riper after they are removed from the vine. In selecting bunches, avoid those where any, or even one of the leaves

have been removed near the bunch, from the tree, because the berries will there be of inferior flavour.

Plums, peaches, nectarines, apricots, and figs—indeed every fruit which has a bloom—may be treated, in such a box as Mr. Gauen describes, with the puff and calcined magnesia. We should have before mentioned, that the false bottoms in his box consist of fine wire gauze, and by a particular process, which cannot always be conveniently followed, he raises a cloud of the powder, which most delicately covers the fruit. It seems remarkable that a white powder should give bloom to fruits of different colours; but the colour resides in the skin, and the bloom is merely a semi-transparent colourless powder. Mr. Gauen considers magnesia as merely a powerful antiseptic, and being preferable to any other article, because it is neither offensive to the taste nor deleterious in any shape.

BY INOCULATION TO MAKE OLD CHESEE OUT OF NEW.

The flavour and appearance of an old cheese may be communicated to new by inserting in the new cheese portions of the old, containing the blue mould. The little scoop which is used in taking samples of cheese is a ready instrument for the operation, by interchanging ten or a dozen of the rolls which it extracts, and placing them so as to disseminate the germ of the blue mould all over the cheese. A new Stilton treated in this way, and well covered up from the air for a few weeks, becomes thoroughly impregnated with the mould, and generally with a flavour hardly to be distinguished from the old one. Mr. John Robinson, Secretary of the Royal Society of Edinburgh, says he has sometimes treated half a Lanarkshire cheese in this way, and left the other half in its natural state, and been much amused with the remarks of his friends on the striking superiority of the English cheese over the Scotch one.

CHEAP METHOD OF CATCHING MICE.

The following stratagem has been successfully employed to destroy in gardens these troublesome little animals. A quantity of bell glasses are placed in the ground, being sunk till they are level with the earth. They are filled half full with water; a little oatmeal is put over the water in the glass, and also a little over the earth, about the outside, to decoy them to a watery grave. The mice are bred for the most part on the outside of gardens, and come in for provisions. In winter they catch best, but, to prevent the water from freezing in the glasses and bursting them, a covering must be used, yet so as to allow the little animals to go under, and reach their fate.

GARDEN OPERATIONS FOR NOVEMBER.

1*st. Kitchen Garden.*

Tie up endive for blanching, continue to earth up cardoons, and dress the plantations of artichokes; that is, cut down their larger leaves, and lay some earth about the plants to protect them during winter. Carrots and parsnips may be taken up and preserved in sand during winter.

Some more peas and beans may be sown to succeed those that were sown last month, or to supply their place if they should be cut off by the severity of the weather.

2*nd. Fruit Garden.*

The best time for pruning vines is immediately after the fall of the leaf, because the greatest possible time in that way is allowed for healing the wounds. Vines that are cut about the time of the rise of the sap in spring, are apt to bleed profusely. This happens sometimes even to those that are pruned in the course of the winter. When pruning is properly performed, the young branches should be left at the distance of from one foot or two feet, and even upwards, from one another; but this in a great measure must be regulated by the size of the leaves. When vines are weakly, each shoot should be shortened so as to have only three or four inches; when they are moderately vigorous, each should be left about a foot long, and so upwards. The shoots, however, that are trained to the rafters of a vinery or pine-stove may be left eighteen or twenty feet long. It has been observed that both the largest grapes and finest clusters are produced on shoots of a considerable length.

If the following directions for training vines in a vinery be observed, they will easily be kept in order, and plentiful crops of good fruit may be expected.

Vines may be planted on the back wall and front of a vinery: those on the back should be from five to six feet asunder, according to the vigour of growth of the particular sort, and in such a position that the two uppermost buds may point east and west; those on the front, so as one may be trained to each rafter. When the vines begin to grow, all the buds, except the two uppermost, must be rubbed off from those on the back wall, and all except the uppermost from those on the front wall. If any of the plants shew fruit the first year, the clusters should be rubbed off as well as the tendrils and lateral shoots, and the principal shoots should be trained regularly as they advance in growth. Fires should be put in the vinery during the spring, to encourage an early growth in the vines, that they may have full time to ripen their wood. In the month of June the glasses may be taken off altogether, but should be put on again in September, and continued till the fall of the leaf, when the vines should be pruned. The two shoots which each vine on the back wall was permitted to push, should be cut down to their third or fourth bud, according as either of them appears fullest and strongest, and then bent down as near as possible to a horizontal position, forming a figure resembling the letter T. Plants in front, that are trained to the rafters, should be cut down almost to the bottom, and no more left than merely sufficient to train them to the rafter. Only two shoots should be permitted to grow on each plant on the back wall, and one on those of the front, and these may be allowed to run the whole height of the house before they are stopped. After the vine shoots are stopped (which is done by pinching off their tops), they will in general push out laterals at three or four eyes, on the upper part of the shoot. These lateral eyes should not be entirely taken off, as it would cause more to push out lower upon the shoots. It would, therefore, be prudent to permit the first laterals to grow twelve or fourteen inches, and then to pinch off their tops. These laterals in their turn will push out secondary laterals, which should be pinched off at the second or third joint, and in that way the sap may be diverted till the end of the season.

The shoots of the plants on the back wall must be brought down to a horizontal position, and cut so that the branches of each plant may reach within a foot of the other. If all the vines on the rafters have pushed vigorously, it will be proper to prune every other plant down to three or four eyes, and the rest to from twenty to twenty-five eyes each, the latter being intended to produce fruit, and the former to make bearing-wood against another year. When the vines begin to push in the spring of the third year, the shoots of those on the back wall should not be allowed to stand nearer one another than a foot or fifteen inches, all the intermediate buds being carefully rubbed off. The shoots ought to be trained up perpendicularly, and however vigorous they may be, no more than one cluster should be allowed to remain on any of them; all of them may run up to the height of five or six feet before they are stopped. The shoots on the rafters that were pruned to twenty or twenty-five eyes each, will probably push at all of them; but not more than five or seven shoots should be permitted to remain, even on the strongest—viz. a leading shoot, and two or three on each side; care being taken to leave one shoot as near the bottom as possible, as the whole branch will require to be pruned down to this shoot next winter. Only one shoot should be left upon

those vines that were pruned down to three or four eyes at every other rafter; and this must be trained up the rafter as in the preceding year. At next pruning season, all the shoots proceeding from the horizontal branches of the vines on the back wall should be pruned down to three or four eyes. The vines on the front which produced fruit should be pruned to their lowest shoot, which should be shortened so as to leave four or five eyes. Those at every other rafter which were shortened the preceding year, and which were allowed to push one shoot, should now be pruned like the bearers of the former year; that is, twenty or twenty-five eyes should be left on each. In the following and all succeeding seasons, those vines on the front will require a similar management, with this difference, that as they acquire more strength, they may be permitted to push more shoots, and more clusters may be allowed to remain on each shoot; for as the vines advance in age, they will certainly be enabled to produce every year, for a certain period, a larger crop of fruit. The spurs of the vines on the back wall, that is, the shoots that were shortened to three or four eyes, should be allowed to push up one shoot; these shoots at next pruning season must be cut so as to leave a long one, viz. about four feet, and a short one alternately. The long ones should be allowed to push five shoots (all the other buds being rubbedoff), the four lateral of which should be cut down to two or three eyes each, at next pruning season, and the terminal one should be left about a foot and a half long. The short shoots between the long ones must constantly be pruned down to two or three eyes each, in order to keep a proper succession of bottom wood. The pruning in the following season must be the same, with this difference, that the upright shoots, as they have acquired a foot and a half additional length, may be allowed to push seven shoots instead of five.

Gooseberries and currants may be pruned any time from the fall of the leaf, till their buds begin to grow in the spring. If these bushes be not well pruned, the fruit will neither be large nor well-flavoured. The principal thing to be attended to is, to keep them open, for they are very apt to become overcrowded with branches; all suckers, therefore, which arise from the root, or shoots which proceed from the main stem, should be removed, because they would only create confusion, by growing up into the heart of the bush. When last summer's shoots stand too thick on the main branches, they should be thinned, and few either of them, or the main branches, should be shortened, because the more they are shortened the more liable they are to run to wood. They who make use of garden shears may save time, and make neat-looking bushes, but will be disappointed with respect to the quantity and quality of their fruit.

3rd. Flower Garden, or Pleasure Ground.

Fibrous-rooted perennial plants may still be planted; likewise bulbous-rooted plants, such as tulips, hyacinths, &c.

Shrubs, and ornamental or forest trees, may be transplanted now, or any time during the winter, when the weather is open.

4th. The Nursery.

Transplant young trees and shrubs, and protect tender seedlings during severe weather.

5th. Green-house and Hot-house.

The plants in the green-house should have air during the day, whenever the weather will permit, and should receive but little water. The plants in the hot-house should likewise receive air during the day, in favourable weather, and fires must be put on every evening, but seldom need to be continued during the day, excepting the weather is very severe.

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METHOD OF PROTECTING CAULIFLOWERS, &c., IN WINTER.

Cauliflowers and other tender plants may be advantageously protected, during winter, in the following manner, as has been practically proved by some ingenious gardeners. The method alluded to is by earthen pots and wooden frames, covered permanently with straw. The pits are most properly made in a south and east border, in an inclosure, or yard, such as is used for hot-beds and composts, the fences of which afford good shelter from the cold quarters. The ground is at first made as level as possible, and also as firm, by trampling in wet weather. The pits are then cut out ten feet in length by about four in breadth, making the sides and ends as firm as can be, beating them with the spades when wet. The depth of the pit is according to the nature of the plants to be kept in it. About nine inches is sufficient for cauliflower plants, and for these, care must be taken that a sufficient quantity of proper soil is left or placed in the bottom of the pit in which they are to be pricked out. Each pit of the above mentioned size holds about four hundred cauliflower plants. For plants in pots, the depth of the pits must be proportioned to the height of them, the tops of which must, when placed in the pits, be below the level of the surface of the ground.

The frames to cover these pits are twelve feet in length by six in breadth; which is a proper size for two men to carry, or to be opened and shut by one person. The timbers to form the sides and ends of the frames are required to be about three inches square, and quite straight. These, when joined together, are placed on a level floor, and slips of timber, two inches in breadth and one in thickness, are nailed lengthways on them, at intervals of nine inches. When the timber work is finished, the straw is fastened on in the manner of thatch, and tied to the bars by rope-yarn. The best sort of straw is that which is obtained by taking the wheat in handfulls out of the sheaf, and beating it against a door firmly fixed on edge, which bruises the straw very little, excepting at the tops. The frames should be kept under cover during summer, that they may be properly dried when put up. With proper care, after this they will last for several years. When the plants are put into the pits, the frames are laid over them. Air is admitted by placing in the ground, near the centre of each pit, a forked stick, about four feet in length, strong enough to support the frames when raised like the lid of a box, and they remain in that position night and day, unless when actual freezing takes place, or when frost is expected in the night. These straw frames are not to be compared with glass, as respects appearance; but they have other advantages besides their cheapness. When they are raised, the plants in the pits have the full advantage of air and sun, and are little exposed to wet, the rain being mostly thrown off on the back of the frames, and when they are shut down, frost cannot easily penetrate through them to the plants; whereas mats and other sorts of coverings are necessary for covering glass, the removing of which, to give air in the middle of the day, and the replacing them at night, is very troublesome, compared with the instantaneous opening and shutting of the straw frames.

Such pits and frames are very suitable for the protection of plants usually kept under glass without artificial heat; but in cases of necessity tender green-house plants may be preserved through the winter in them, when they would perish under hot-bed frames.

CLIMATE, IN REFERENCE TO HORTICULTURE.

Agriculture has for its principal objects the fertilization of the soil by manures, and various processes of cultivation best adapted to the peculiarities of any given climate, and the growth of such plants as are either indigenous, or inured to the vicissitudes of weather incidental to a particular country. But Hor-

ticulture contemplates a wider field; for, besides the points above mentioned as belonging to agriculture, it aspires to the preservation and propagation of exotics, and therefore embraces the consideration of various climates, whilst it endeavours, by artificial means, to neutralize and command the seemingly untractable elements to be encountered in foreign soils and hostile latitudes.

Horticulture may be conveniently treated, in reference to climate, either as controlling and invigorating its natural powers in the open air, or as composing and maintaining a confined atmosphere, whose properties may assimilate with those of the atmosphere natural to the particular plants to be cultivated.

The basis of the atmosphere is known to consist of the same chemical parts in all regions. The modifications of these parts of light, heat, and moisture, and even as regards the open air, depends much on artificial powers, as is amply proven every day in every well-managed garden in the land. We shall, therefore confine ourselves to the atmospheric character and variations of our own situation, which are not merely great, but often sudden. The main object of the horticulturist is to stretch, as it were, his climate to the south, where the extremes of drought and cold do not occur; and not only to guard against the injurious effects of the ultimate severity of the weather, but to ward off its sudden changes in the different seasons of the year. Let us here remember how these changes are brought about in the general course of nature. The principal of them are wind and radiation.

Evaporation and exhalation depend upon the saturated state of the air with moisture, and the velocity of its motion. When the air is dry, vapour ascends in it with great rapidity, and the energy of this action is much promoted by wind. Over the state of saturation the horticulturist has little power, but over its velocity he has some control, by means of various sorts of screens. And the use of high walls, especially upon the northern and eastern sides of a garden, cannot therefore be doubtful, whilst, in the case of tender fruit trees, such screens should not be far apart.

Radiation also produces sudden and injurious influences upon tender plants. Experience has taught gardeners the advantages of warding off the effects of frost by loose straw or other litter. Now, it should be borne in mind that the radiation is only transferred from the plant to the mat, and therefore, contact between the two should be prevented, for thus the stratum of air which is enclosed will, by its slow conducting power, effectually secure the plant.

Little is in the power of the horticulturist to effect, in the way of exalting the powers of the climate in the open air, except by choice of situation with regard to the sun, and the concentration of its rays upon walls and other screens. Draining and drying the soil immediately subject to his culture, can have nothing like a perceptible influence on the climate. As respects the choice of situation, however, it should be borne in mind, that not a little depends on whether it lay in a low, and where a perfectly still atmosphere dwells; for the utmost concentration of cold can only take place in such a situation. Accordingly, a heavy mist is often formed in meadows, and a valley surrounded by low hills is more liable to the effects of radiation than the tops and sides of the hills themselves. It is also a well known fact, that dew and hoar-frost are always more abundant in the former than in the latter situations. It is not, however, meant to include in these observations places surrounded by lofty and precipitous hills, which obstruct the aspect of the sky. Gentle slopes, which break the undulations of the air without naturally circumscribing the heavens, are most efficient in promoting this action, and it is worthy of remark, that by walls and other fences we may artificially combine circumstances which may produce the same injurious effects. The advantages of placing a garden on a gentle slope are very apparent, from those and many other facts and principles.

As to a confined atmosphere, where the gardener has to exert the utmost artificial skill, let it also be remarked, that the plants themselves are in the most artificial state that it is possible to conceive, for not only are their stems and foliage subject to the vicissitudes of the air in which they are immersed, but, in most cases, their roots also are so exposed. The soil in which they are set to vegetate is generally contained in porous pots of earthenware, to the interior surface of which the tender fibres quickly penetrate and spread in every direction; they are thus exposed to any change of temperature and humidity, and are liable to great chills from any sudden increase of evaporation.

Gardeners are generally studious of the temperature of hothouses, but there are connected with moisture considerations perhaps no less important. The climate of the torrid zone, to which the inhabitants of these houses belong, is highly vapourous, and hence we may learn the necessity of a strict attention to the atmosphere of vapour in our artificial climates. Here it may be remarked, that tropical plants require to be watered at the root with great caution; but it is impossible that a sufficient supply of vapour can be kept up from this alone: to overcome the deficiency, the keeping of the floor of the house wet, as also the flues, is practised by some enlightened horticulturists, by which means an atmosphere of great elasticity, analogous to the natural process, may be maintained. To the human feelings, the impression of an atmosphere so saturated with moisture is different from one heated to the same degree without this precaution. Persons who have been used to hot climates, have declared that the feel and smell of the latter exactly assimilate to those of the tropical regions.

These are a few disjointed observations and particulars connected with climate, as applicable to horticulture, but the number and variety of other necessary attentions is great, and unless kept up, some of the things now recommended would become injurious.

THE COUNTY OF ANTRIM.

The particular for our purpose, suggested as a leading feature in an account of Antrim, and indeed of several other counties in the north of Ireland, is the growth and manufacture of flax, for numerous purposes. Of the mode pursued in the cultivation of this crop, and its preparation for being spun, we shall now only speak in reference to Antrim.

The different kinds of flax-seed sown in this county are the Dutch, the American, and the Riga. The Dutch seed is said to be the produce of the Riga seed, raised in the Netherlands; yet the character of the seeds as imported to Ireland are very different. The Dutch kind is sold at a higher price than the others, from its supposed superior produce. The Riga is more esteemed than it once was; but the American is the most generally used. Some years ago the annual average importation of flax-seed into Belfast was 5,000 hogsheads of about seven bushels each. If flax-seed is well saved and carefully stored it will keep for several years. The time of sowing is as early as the spring season will permit, and the sooner the seed is committed to the ground, provided it is in good order, the better; the texture will also in that case be the stronger and firmer. April is the usual time in the southern parts of the county.

There has been a great change in opinion respecting the preparation necessary for flax. A potato crop was thought to be the certain mode of bringing the ground into a proper condition for it, but now it is known that it will succeed on lea ground, or on stubbles that have been carefully tilled. Flax acts somewhat as a fallow crop itself: it is tap-rooted, and feeds far below the surface, so that it is a good preparation for grain. When it is sown after potatoes, a stroke of the harrow is given before sowing; one stroke is sufficient to cover it afterwards. If it is sown on ground that has been prepared by ploughing for it, the ground is well harrowed before the seed is put on it, then covered as before mentioned. The greatest quantities of flax, it is believed, have been produced after potatoes; but land

that is not fit to be sown with grain will yield a good return under the former.

The quantity of seed sown, when it is cultivated on a large scale, is about three and a half bushels to the Irish acre; where only a small portion, generally thicker, with the idea of having finer flax. When three or four inches long, it is most carefully weeded, if it requires, and after weeding there is a rapid growth. The rolling which it receives from the weeders squatting themselves upon the ground seems beneficial.

The time for pulling flax depends on many circumstances: If it is required for spinning fine it is pulled not long after the flower falls; if it is beaten down by rain, so that it cannot stand erect again, it must also be pulled to prevent it from rotting; but if it is to stand for seed, the stalks must be fully ripe and the heads well filled. Doctor Stephenson says, justly, that the different growths ought to be pulled and kept separately, and appropriated to different purposes, for the qualities being very distinct, they will not work to advantage together. The next step in the management of a flax crop is the watering it. This is a critical process, and requires great skill to be properly executed, and to find the proper time when, by taking it out of water, the fermentation must be stopped.

Waters of different qualities operate differently, and the warmth or coldness of the weather has a similar effect. It has been recommended that ponds should be sunk in clay, four feet deep, six wide, and long according to the quantity of flax to be watered. If the soil is not clay, to have the pits lined with it, may be used, and so situated that a stream of pure water may be turned into them. These ponds should not be under the shade of trees, which causes a variation in the temperature, nor where astringent leaves fall, for they may discolour the flax. When the bark separates from the stalk, which is, however, by rubbing it between the fingers, then the process seems to be finished.

It should have been stated, when speaking of proceeding to water the flax, that it is tied in bunches, such as a man can grasp with his hands, each bundle tied in the middle and at both ends. Stakes with hooks are driven into the sides of the pond, five or six feet asunder, level with the surface of the water. The bundles are then thrown into the water about twelve inches from each other; a pole is fixed under the hooks at each side, along each bank; the bundles are pressed down by poles across the pond, each end of which is under the poles, parallel to the sides. Poles and brushwood may be taken from any kind of trees, except such as have astringent bark. The intention in these operations is the production of fine filaments without stains. The flax, therefore, is never allowed to touch the sides or the bottom of the pond.

The next thing to be done after the watering is the grassing of the flax. Meadows are generally selected for this purpose, for one reason, perhaps, that they are free from cattle. But if they are rich and quick of growth, and wet weather comes on, there is a chance of rotting the flax before it is sufficiently grassed; turning is the only remedy. When it has been grassed for a sufficient length of time, which is found by the manner of its breaking, and by the feel, it is dried, and put up until convenience offers to have it broken, before being milled. After this it is ready for the hackle, and here, unless the seed is saved, the farmer's labour ceases, and it becomes a matter of manufacture and of commerce.

When the flax is intended to stand for seed, the steps already described are those that must also be now followed, until the time of pulling, for that which stands for seed must be longer on the ground, to allow the heads to fill. When the pulling is accomplished it is put in stacks, where it is allowed to stand for different periods, according to the manner in which the seed is to be disposed of. If it is to be saved by rippling, which is performed by drawing the flax through a row of spikes fixed in a plank, it is not required to stand so long as when it is to be put into a stack, because part of the drying is done by spreading it, after the rippling, on cloths exposed to the sun and air. But when the stacking of it is intended, it must stand in the field long enough to be so well saved that no danger of heating may ensue. It must next be put on a stand, to protect it from vermin, which are very fond of it, and there it may remain till the seed is wanted, when it may be beaten out with flails. Those who cultivate flax for seed may be said, therefore, to sacrifice the former. Yet if not watered in the usual way, but spread in the first instance on the grass, where it is necessary to allow it to remain much longer than if it had undergone that process, the produce will often be of a superior strength and fineness, and considerable in quantity. The seed which is raised upon an acre of land may be rated at from one to two hogsheads. In Ireland, however, seed is hardly ever saved.

This extremely useful article of farming, when used for flax, returns from the mill in a rough state, without the coarser and finer fibres being separated. The hackling is the process by which such severing is accomplished, when one-third of the fine may be the proportion to the coarse. This last is called *tow*, which is used for cheap fabrics. We shall only further add, that flax, when allowed to ripen ere it be pulled, is a scourging crop, though if pulled when in the flower it is not particularly so; a few days of its ripening progress exhausting much more of the riches of the soil than the same number at a previous period of its growth.

ARGYLESHIRE

Is a maritime county in the west Highlands of Scotland, bounded on the north by Invernesshire; on the east by Perthshire, Dumbartonshire, and the Frith of Clyde; on the south by the Irish Sea; and on the west by the Atlantic Ocean. Besides a mainland, it embraces a great number of islands, falling within the general class of the Hebrides. The continental part, in its greatest length, extends to about 115 miles; its greatest breadth to nearly 70 miles. On the two sides, which border on the sea, the land is everywhere indented with deep bays and creeks, winding in a variety of directions, and shooting, as if most fantastically, long arms into the land, forming the whole into a number of peninsulas. The county altogether abounds more in romantic scenes than in fertile plains; its general features are striking and varied in the highest degree. Towards the northern parts it possesses the wild and savage grandeur of the true Highlands of Scotland, some of the mountains rising several hundred feet above 3000; and these are piled upon one another in most magnificent disorder.

But scenery is not what we are at present engaged upon; we are only going to give a short account of a few features belonging to Argyleshire, in its agricultural, productive, and economical history; and these are in reference to cattle, to coppice-wood, and to kelp.

The native breed of cattle in Argyleshire, as it is now improved, is well known to be equal, if not superior, to any other race in Scotland, for fattening. They are sent from the county in a store condition, commonly when about three years old, and fatted on the pastures of the south, the greater number for the consumption of England. They are a small hardy breed, generally weighing, when fat, from five to six stone per quarter. The form most wished for is, to get them short in the legs, round in the body, straight in the back, and long in the snout. They are of various colours—black, dun, brindled, and brown; but the black is the most common and the most run upon. Crossing the breed with any other than the true Highland breed ought to be avoided, as it is found from experience that by any other management they degenerate in the quality of the beef and in feeding true, though not in size. They are not wrought, nor well calculated for working, from the smallness of their size. It is a general opinion that the bull should be changed every third year, as, otherwise, the breed is thought to degenerate. Bulls are commonly disposed of at the age of six, though they retain their vigour till they are ten years old; and no

person wishes to have more than is necessary to serve his field of cows. Premiums given to those who have the best bulls has been found the best method of encouraging particular breeds.

The handsomest cows of the native breed, and such as have the strongest bone, do not give much milk, but what they have is very rich. Rearing, however, is more attended to than the dairy, to which, at present, we confine ourselves. Cows commonly calve in March and April. No calves are reared without getting milk; they are almost all allowed to suck the cows, which is considered preferable to what is called rearing by the dish. They are weaned at six months of age, and for the last eight days are allowed to suck their dams only once a-day, till the cows dry up. They are then separated, and put into hay or some other rich pastures. True-bred Highland cows ought never to be kept after they are nine years old, as after that age they do not feed true. Indeed, the English buyers do not wish them older than six at most; and they buy heifers of three, four, and five years old, much higher in proportion to their weight than cows of the same breed that are more advanced in age. Some winter their calves in open sheds, when they are fed with hay in racks, and have the liberty of going out and in at pleasure. This makes them hardier and truer feeders than close confinement can do. The distempers to which this race of cattle are most liable are the black spall, bloody water, flux, and picking calf.

When speaking of distempers in cattle, we may remark that scientific knowledge is still greatly wanting among those who pretend to be cattle doctors. We may, therefore, mention a few methods of treatment in particular cases, which are practised in various quarters of the country, and often with success. For instance, as regards *black spall*, some say that the keeping of one or two swine to pasture with the cattle is a sure preventive. Perhaps these animals eat up some plants that are injurious to the cows. As to premature calving, bleeding when they are from one-third to half gone with calf is earnestly recommended by some; and when the accident does happen, to bury the abortion immediately, and to keep the cow as widely apart as possible from the herd; to be particularly careful that she does not receive the bull that may herd with the cows, at least not till such a lapse of time as, with good reason, she may be thought completely recovered, and free from the possibility of communicating the smallest infection.

For the disease called the red water, or bloody urine, bleeding and change of food have been in many parts found effectually to answer. A handful of salt, and a handful of oatmeal, after being fried in the pan, are given in a quart of cold butter-milk, in some districts, the beast being kept from food some time before; this once or twice given is said to remove the complaint, if not too long neglected. Should the cow be bound after the application of the remedy, stiff oatmeal gruel, two quarts at a time, should be given twice or thrice a-day till the complaint is removed.

For *scouring* in calves, milk and water thickened with bean or wheat flour is given for their food till the scouring is removed, or one or two half-pint drenches of rennet. When the teat of a milch cow cracks, and the bag becomes hard and inflamed, with swelling in the udder (called the *gargle* in some parts), the cow should be blooded, her udder well washed and anointed with hogs'-lard or sweet-oil, or other ointment; some recommend washing with butter-milk and salt, or salt and water. For *swelling in clover*, some recommend two ounces of Castile soap, and some an egg-shell full of tar, to prevent the necessity of tapping; but others apply what is more effectual—a hollow cane thrust down, four or five feet long, with a syringe in it, to extract the air and remove any obstruction at the mouth of the maw. When a potato or turnip sticks in the throat, it may be thrust down with a staff or any smooth piece of wood.

A great part of Argyleshire was once covered with wood, of which every moss still shows the remains. It might have been as desirable to get rid of some of it as it is now to rear it; but, as it often happens, men run from one extreme to the other, and the loss was severely felt before any attempt was made to repair it. Even so late as the commencement of the last century the woods in this county, though greatly reduced, were held to be of so little value, especially in the inland parts, that a large fir wood was sold to a company of Irish adventurers at the rate, it is said, of the third part of a penny per tree. Some time after that, however, the remaining deciduous woods were brought into greater estimation, by means of two English companies, who set up iron factories in the county.

But what characterizes the woods of many parts of the West Highlands of Scotland now, is the natural coppices that are periodically cut, commonly every nineteen or twenty years; and at one time the returns were at the rate of twenty shillings per acre annually, but the value of this article has of late greatly diminished. It is computed that there are about 40,000 acres of this wood in Argyleshire, and therefore it has become an important particular in the history of produce of the county. When these coppices are cut, it is usual to leave a number of oak standards, such as the parties agree are to be spared. Of the timber that is cut, so much as is needed for county use is sold; the rest is made into charcoal, and the bark, especially that of the oak, disposed of to the tanner. The wood is then inclosed, commonly for six or seven years, during which time, however, some allow it to be pastured by horses. Some thin or weed their growing woods, by taking out such a number as it may spare for barrel hoops; but others leave the matter to nature, and allow the stronger to destroy the weaker. The more active proprietors are at great pains to encourage the growth of oak, by cutting away any other kinds that interfere with it.

The season of cutting oak is when the bark rises, from the beginning of May till Midsummer. The trees should be cut close to the ground, that the young shoots may spring from the ground, rather than from the old stocks. The stocks should be cut clean and rounded, that no matter may lodge upon them, which would make them rot. Care must be taken that the trees that are left for standards should be healthy and vigorous, and such as have grown in open roomy places without shelter, as otherwise they will not bear to be exposed, and they should by no means be deprived of any of their branches.

From the immense extent of sea-coast which borders Argyleshire, sea-weed may be presumed to be plentiful on its shores; indeed, kelp, which is made from this weed, is manufactured in the county to the amount of 800 tons annually. The process of the manufacture is thus: the rocks which are dry at low water are the beds of great quantities of sea-weed, which is cut, carried to the beach, and dried; a hollow is dug in the ground, three or four feet wide; round its margin are laid a row of stones, on which the sea-weed is placed, and set on fire within, and quantities of this fuel being continually heaped upon the circle, there is a perpetual flame in the centre, from which a liquid like melted metal drops into the hollow beneath; when it is full, as it commonly is ere the close of the day, all heterogeneous matter being removed, the kelp is wrought with iron rakes, and brought to a uniform consistence, in a state of fusion. When cool, it consolidates into a heavy dark-coloured alkaline substance, which is used in soap and glass making, and in bleaching. Different species of sea-weed, belonging to the genus *fucus* and order *algae*, are cultivated for kelp. Fuci cut when two or three years old, yield more in proportion to bulk than when suffered to stand longer.

The county of Antrim, of which we have in a former paper taken some notice, furnishes in one quarter excellent kelp. This is on the rocky shore of the Giant's Causeway, and on the north side of the island of Rathlin. In those places the beach is free from sand. In Rathlin the quantity is so great, that the rents are paid by kelp. The best is that which the weeds, cut from the rocks at a considerable depth, furnishes, which afford a good crop every second year. May is the best time for making this article.

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ROGET'S ANIMAL AND VEGETABLE PHYSIOLOGY.

The portion of this talented and popular treatise which falls within our department, though it occupies a comparatively small share of the author's system of physiology, still affords ample materials for a review. Indeed, the simplest forms of organized existence is a perfect and marvellous proof of infinite wisdom, the most excellent design, of Almighty power. And were we possessed of intelligence of the highest order, perhaps we should make no distinction, in judging of the Creator's contrivance, in point of perfection, whether it is looked at in the vegetable or animal kingdoms. For the truth is, that nothing short of creative, divine, infinite Intelligence, can either fathom the extent of the powers necessary to the production of a single blade of grass, or have any notion of the manner in which those Supreme powers have been exerted. Our purest and most direct language is at fault the moment that it begins to describe, in those particulars. The very simplest words bear no adequate relation to the things spoken of. The terms *extent* and *exerted*, which we have used, are not applicable to the Creator, and are only excusable because we have no other medium, by which to communicate our notions, than such as is familiar to us in *our* modes of procedure. According to this view, were we sufficiently acquainted with what is necessary to vegetable productions and organization, we should, perhaps, feel as much cause of wonder and adoration, as in the contemplation of the highest created intelligence. At least, this can be asserted of human penetration and ability, that what appears to us the very simplest of organic products, namely, Sugar, defies all the powers of man, aided by the most extensive chemical knowledge, to create, though the elementary parts were set before him. Heat, moisture, and soil, we know to be necessary to vegetable life; or it may be stated thus:—The elements of organic substances are oxygen, carbon, hydrogen, nitrogen, sulphur, and phosphorus, together with a few of the alkaline, earthy, and metallic bases. Yet, though possessed of all these, man cannot create, or rather combine them, so as to produce organic action and life that is in any shape or degree like to what they are in the simplest object in the vegetable or animal world.

But although we cannot *create*, we can, in some degree, appreciate the beauty, the skill, and the wonders of *creation*. In this way too, we are entitled and bound to read the character of the Almighty Artificer. Nor can the inquirer do better than peruse Dr. Roget's Treatise, as a help to this instructive study. We take him up where he is treating of the *vital functions*; and let us just for a moment think of the processes necessary to *nutrition*. There is here, the reception of certain materials from without, and their preparation as well as gradual conversion into proper nutriment, that is, into the same chemical properties with the substance of the organs with which they are to be incorporated. There is *circulation* to convey the nutritive fluids thus elaborated to the organs that are to be nourished. There is secretion, excretion, and absorption, with modifications of other processes, which we have not room to describe, because they are so minutely perfect, that even the minutest description fails in doing justice to them. We rather go on now to present some passages from the learned Treatise we have taken up; and this we shall do without any critical links of our own formation, since nothing can be more interesting than the author's words and information. The nutrition of vegetables is, according to human modes of conception, the simplest exhibition of the process of feeding:—

"§ 1. *Food of Plants.*

"The simplest kind of nutriment is that presented to us by the vegetable kingdom, where water may be considered as the general vehicle of the nutriment received. Before the discoveries of modern chemistry, it was very generally believed that plants could subsist on water alone; and Boyle and Van Helmont, in particular, endeavoured to establish by experiment the truth of this opinion. The latter of these physiologists planted a willow in a certain quantity of earth, the weight of which he had previously ascertained with great care; and during five years, he kept it watered with rain water alone, which he imagined was perfectly pure. At the end of this period the earth had scarcely diminished in weight, while the willow had grown into a tree, and had acquired an addition of one hundred and fifty pounds: whence he concluded that the water had been the only source of its nourishment. But it does not seem to have been at that time known that rain water always contains atmospheric air, and frequently also other substances, and that it cannot, therefore, be regarded as absolutely pure water: nor does it appear that any precautions were taken to ascertain that the water actually employed was wholly free from foreign matter, which it is easy to conceive it might have held in solution. In an experiment of Duhamel, on the other hand, a horse-chestnut tree and an oak, exposed to the open air, and watered with distilled water alone, the former for three, and the latter for eight years, were kept alive, indeed, but they were exceedingly stinted in their growth, and evidently derived little or no sustenance from the water with which they were supplied. Experiments of a similar nature were made by Bonnet, and with the like result. When plants are contained in closed vessels, and regularly supplied with water, but denied an access to carbonic acid gas, they are developed only to a very limited extent, determined by the store of nutritious matter which had been already collected in each plant when the experiment commenced, and which, by combining with the water, may have afforded a temporary supply of nourishment.

"But the water which nature furnishes to the vegetable organs is never perfectly pure; for, besides containing air, in which there is constantly a certain proportion of carbonic acid gas, it has always acquired, by percolation through the soil, various earthy and saline properties, together with materials derived from decayed vegetable or animal remains. Most of these substances are soluble, in however minute a quantity, in water: and others, finely pulverized, may be suspended in that fluid, and carried along with it into the vegetable system. It does not appear, however, that pure carbon is ever admitted; for Sir H. Davy, on mixing charcoal, ground to an impalpable powder, with the water into which the roots of mint were immersed, could not discover that the smallest quantity of that substance had been, in any case, absorbed. But in the form of carbonic acid, this element is received in great abundance, through the medium of water, which readily absorbs it; and a considerable quantity of carbon is also introduced into the fluids of the plant, derived from the decomposed animal and vegetable materials, which the water generally contains. The peculiar fertility of each kind of soil depends principally on the quantity of these organic products it contains in a state capable of being absorbed by the plant, and of contributing to its nourishment.

"The soil is also the source whence plants derive their saline, earthy, and metallic ingredients. The silica they often contain is, in like manner, conveyed to them by the water, which it is now well ascertained, by the researches of Berzelius, is capable of dissolving a very minute quantity of this dense and hard substance. It is evident that, however small this quantity may be, if it continue to accumulate in the plant, it may in time constitute the whole amount of that which is found to be so copiously deposited on the surface, or collected in the interior of many plants, such as the bamboo, and various species of grasses. The small degree of solubility of many substances thus required for the construction of the solid vegetable fabric, is, probably, one of the reasons why plants require so large a supply of water for their subsistence.

"§ 2. *Absorption of Nutriment by Plants.*

"The greater number of cellular plants absorb water with nearly equal facility from every part of their surface: this is the case with the *Algæ*, for instance, which are aquatic plants. In *Lichens*, on the other hand, absorption takes place more par-

tially; but the particular parts of the surface where it occurs are not constantly the same, and appear to be determined more by mechanical causes than by any peculiarity of structure; some, however, are found to be provided in certain parts of the surface with stomata, which De Candolle supposes may act as sucking orifices. Many mushrooms appear to be capable of absorbing fluids from all parts of their surface indiscriminately; and some species, again, are furnished at their base with a kind of radical fibrils for that purpose."

The other passages are happily described and illustrated as follows:—

"Several opinions have been entertained with regard to the channels through which the sap is conveyed in its ascent along the stem, and in its passage to its ultimate destination. Many observations tend to show, that, in ordinary circumstances, it is not transmitted through any of the distinguishable vessels of the plant: for most of these, in their natural state, are found to contain only air. The sap must, therefore, either traverse the cells themselves, or pass along the intercellular spaces. That the latter is the course it takes, is the opinion of De Candolle, who addnces a variety of arguments in its support. The sap, he observes, is found to rise equally well in plants whose structure is wholly cellular; a fact which proves that vessels are not in all cases necessary for its conveyance. In many instances the sap is known to deviate from its usual rectilinear path, and to pursue a circuitous course, very different from that of any of the known vessels of the plant. The diffusion of the sap in different directions, and its subsidence in the lowest parts, on certain occasions, are facts irreconcileable with the supposition that it is confined to the vessels.

"Numerous experiments have been made to discover the velocity with which the sap rises in plants, and the force it exerts in its ascent. Those of Hales are well known: by lopping off the top of a young vine, and applying to the truncated extremity a glass tube, which closed round it, he found that the fluid in the tube rose to a height, which, taking into account the specific gravity of the fluid, was equivalent to a perpendicular column of water of more than forty-three feet: and, consequently, exerted a force of propulsion considerably greater than the pressure of an additional atmosphere. The velocity, as well as the force of ascent, must, however, be liable to great variation; being much influenced by evaporation, and other changes, which the sap undergoes in the leaves. Various opinions have been entertained as to the agency by which the motion of the sap is effected; but although it seems likely to be resolved into the vital movements of the cellular structure already mentioned, the question is still enveloped in considerable obscurity. There is certainly no evidence to prove that it has analogy to a muscular power; and the simplest supposition we can make is, that these actions take place by means of a contractile property belonging to the vegetable tissue, and exerted, under certain circumstances, and in conformity to certain laws, which we have not yet succeeded in determining."

"§ 4. *Aeration of the Sap.*

"A chemical change much more considerable and important than the preceding is next effected on the sap by the leaves, when they are subjected to the action of light. It consists in the decomposition of the carbonic acid gas, which is either brought to them by the sap itself, or obtained directly from the surrounding atmosphere. In either case its oxygen is separated, and disengaged in the form of gas; while its carbon is retained, and composes an essential ingredient of the altered sap, which, as it now possesses one of the principal elements of vegetable structures, may be considered as having made a near approach to its complete *assimilation*, using this term in the physiological sense already pointed out.

"The remarkable discovery that oxygen gas is exhaled from the leaves of plants during the day time, was made by the great founder of pneumatic chemistry, Dr. Priestley: to Sennebier we are indebted for the first observation that the presence of carbonic acid is required for the disengagement of oxygen in this process, and that the oxygen is derived from the decomposition of the carbonic acid; and these latter facts have since been fully established by the researches of Mr. Woodhouse, of Pennsylvania, M. Théodore de Saussure, and Mr. Palmer. They are proved in a very satisfactory manner by the following experiment of De Candolle.

"Two glass jars were inverted over the same water-bath, the one filled with carbonic acid gas, the other filled with water, containing a sprig of mint; the jars communicating below by means of the water-bath, on the surface of which some oil was poured, so as to intercept all communication between the water and the atmosphere. The sprig of mint was exposed to the light of the sun for twelve days consecutively: at the end of each day the carbonic acid was seen to diminish in quantity, the water rising in the jar to supply the place of what was lost, and at the same time the plant exhaled a quantity of oxygen exactly equal to that of the carbonic acid that had disappeared. A similar sprig of mint, placed in a jar of the same size, full of distilled water, but without having access to carbonic acid, gave out no oxygen gas, and so on perished. When, in another experiment, conducted by means of the same apparatus as was used in the first, oxygen gas was substituted in the first jar instead of carbonic acid gas, no gas was disengaged in the other jar, which contained a sprig of mint. It is evident, therefore, that the oxygen gas obtained from the mint in the first experiment was derived from the decomposition, by the leaves of the mint, of the carbonic acid, which the plant had absorbed from the water."

All scientific researches, as well as every other branch of study in which man can employ his mind, ought to lead to moral results. We are rational beings; nay, more, we are responsible beings; and religion should be taught by science.

"The Great Author of our being, who, while he has been pleased to confer on us the gift of reason, has prescribed certain limits to its powers, permits us to acquire, by its exercise, a knowledge of some of the wondrous works of his creation, to interpret the characters of wisdom and of goodness with which they are impressed, and to join our voice to the general chorus which proclaims 'His Might, Majesty, and Dominion.' From the same gracious hand we also derive that unquenchable thirst for knowledge, which this fleeting life must ever leave unsatisfied; those endowments of the moral sense, with which the present constitution of the world so ill accords; and that innate desire of perfection which our present frail condition is so inadequate to fulfil. But it is not given to man to penetrate into the counsels, or fathom the designs of Omnipotence; for in directing his views into futurity, the feeble light of his reason is scattered and lost in the vast abyss. Although we plainly discern intention in every part of the creation, the grand object of the whole is placed far above the scope of our comprehension. It is impossible, however, to conceive that this enormous expenditure of power, this vast accumulation of contrivances and of machinery, and this profusion of existence resulting from them, can thus, from age to age, be prodigally lavished, without some ulterior end. Is Man, the favoured creature of nature's bounty, 'the paragon of animals,' whose spirit holds communion with celestial powers, formed but to perish with the wreck of his bodily frame? Are generations after generations of his race doomed to follow in endless succession, rolling darkly down the stream of time, and leaving no track in its pathless ocean? Are the operations of Almighty power to end with the present scene? May we not discern, in the spiritual constitution of man, the traces of higher powers, to which those he now possesses are but preparatory; some embryo faculties which raises us above this earthly habitation? Have we not in the imagination, a power but little in harmony with the fetters of our bodily organs; and bringing within our view purer conditions of being, exempt from the illusions of our senses and the infirmities of our nature, our elevation to which will eventually prove that all these unsated desires of knowledge, and all these ardent aspirations after moral good, were not implanted in us in vain?"

Description of the Engravings.

CAMPANULA GLOMERATA.

CLUSTERED BELL-FLOWER.

Pentandria. Monogynia, LINN.

Campanulacæ. JUSS.

Gen. Char.—Corolla campanulate, closed at bottom with staminiferous valves. Stigma 3, 5-cleft. Capsule inferior, opening by lateral pores.

Spec. Char.—Stem angular, simple, smooth. Leaves scabrous, oblong, lanceolate, cordate, sessile. Heads clustered.

Campanula, a little bell. Glomerata, brought into a heap, from its head of flowers, which is often more crowded than is shown in our specimen.

This species, as well as a white variety, which is not uncommon, is desirable, from its unobtrusive growth, its habit of free flowering, and the little care demanded in its cultivation.

BUPHTHALMUM GRANDIFLORUM.

GREAT-FLOWERED OX-EYE.

Syngenesia. Polygamia. Superflua. LINN.

Compositæ. Sub. ord. *Helianthoeæ.*

This showy herbaceous plant is sometimes raised from seed, and its offspring frequently presents trifling varieties of appearance. The roots also admit of division for increase, and these may be planted in any common garden soil, in whatever aspect is most convenient.

DIANTHUS DELTOIDES.

MAIDEN PINK.

Decandria Digynia. LINN.

Nat. Ord. *Caryophylleæ.* D. C.

Gen. Char.—*Calyx* cylindrical, 1-leaved, with scales at the base. *Petals* 5, clawed. *Capsule* cylindrical, 1-celled.

Spec. Char.—*Stem* decumbent, branched. *Flowers* solitary. *Scales* ovate, lanceolate, acute twin. Upper leaves narrow, acute; lower oblong, obtuse.

Found on sandy banks and heaths, in various parts of England, growing prostrate among grass and other herbs, for want of the natural shelter of which it is not easily, in a garden, cultivated. There are two varieties of this pink, one of them of a blush colour, and for this reason, Gerard says, it is called the "Maidenly Pink." The petals vary much in colour, being sometimes of a very pale flesh colour, and sometimes deep red; but they are always marked with a ring of deeper red dots near the centre of the flower. The other variety, which is very common in gardens, has white flowers, with a beautiful purple ring, and leaves rather more glaucous.

Both varieties are extremely pretty, and should not be wanting in any collection of this admired family. They flower in June and July, and continue flowering till late in the autumn. May be increased by a division of the roots, made early in the spring, and planted either in a pot or in a dry border of the garden, carefully observing to protect them from too great a portion of moisture, which is very injurious to the whole of the Dianthus tribe.

SPIRÆA TRIFOLIATA.

THREE-LEAVED SPIRÆA.

Icosandria Di-pentagynia, LINN.

Nat. Ord. Spiræceæ. D. DON.

Gen. Char.—Calyx, spreading 5-cleft; Petals, 5; Capsule, 1-celled, 2-valved, opening inwards, 1-3 seeded.

Spec. Char.—Stipules, linear entire; Calyx, tubular campanulate.

Of this genus both the flower garden and shrubbery are indebted for some of their chief ornaments. Of the hardy herbaceous species the *trifoliata* is considered as one of the most elegant; when it grows in perfection it certainly is a most delectable plant, generally rising to the height of two feet, with a profusion of flowers. These continue from July to September.

It is usually increased by parting its roots. Miller says that the seeds of it should be sown in the autumn, to ensure their vegetation in the spring. The best situation for this plant is a north border; it loves moisture, and should be planted in light bog or peat earth, or a mixture of it and a pure hazel loam.

This species, and the *S. Stipulacea*, have lately been separated from their original family to constitute a new genus, under the title *Gillenia*, each plant still retaining its former trivial name.

A native of N. America, introduced in 1713.

PRIMULA CORTUSOIDES.

CORTUSA-LEAVED PRIMROSE.

Pentandria Monogynia. LINN.

Nat. Ord. *Primulaceæ.* BROWN.

Gen. Char.—*Capsule*, 1-celled; *Corolla*, funnel-shaped, pervious at the orifice; *Stigma*, globose.

Spec. Char.—Leaves cordate, stalked, doubly crenate, smooth beneath, hairy at the veins; stalk villous; umbel many-flowered, erect, the length of the tube.

In the wrinkled appearance of its foliage this species approaches the *Primula Acaulis*, whilst in its inflorescence, the colour of its flowers, and solitary scape (which rises to an unusual height), it bears an affinity to the *farinosa*. It flowers in June and July, and may be raised from seeds, or propagated by parting its roots; but it is apt to be lost if not duly attended to. It requires to be kept in a pot filled with equal parts of loam and bog earth, to be placed in a moist shady situation in the summer, and in a frame in the winter, when it loses its leaves entirely, and forms a sort of bulbous hybernaculum under ground. This circumstance is the more necessary to be known, as it subjects the plant to be thrown away as dead.

This very rare species of Primula, called *cotusoides*, on account of the similitude of its foliage to that of the *Cortusa Matthioli* of Linneus, is a native of Siberia, and introduced into this country in 1794.

PHYTEUMA ORBICULARE.

ROUND-HEADED RAMPION.

Pentandria. Monogynia. LINN.

Campanulaceæ. JUSS.

Phyteuma is a term used by the Grecian writers, and is allowed to have been derived from PHUTEUO, to sow. Orbiculare, from the Latin Orbis, an orb or circle, the application of which is evident.

Each corolla, of this species of Phyteuma, forms a little curved horn; and it is rather remarkable that the five cohering segments, into which each corolla divides itself, first separate at their lower part, and form openings, after the fashion of the Spanish costume, usually termed slashing.

SCUTELLARIA COLUMNÆ.

HEART-LEAVED SCULL-CAP.

Didynamia Gmynospermia. LIN.

Labiatæ. BROWN

Gen. Char.—Calyx entire, after flowering closed with a lid. Tube of the Corolla elongated.

Spec. Char.—Leaves oblong, cordate, serrate, pubescent spikes elongated, 1-sided. Bractes stalked, ovate, shorter than the Calyx.

The flower of the Scutellaria Columnæ will recommend itself by its beauty, independently of any further attraction. It may be planted in the open border, in light soil, where it will increase, and sometimes produce seeds. It may afterwards be divided; or seeds may be sown in the spring, in pots, or on an open border of rich earth. It may also be struck from cuttings of the young shoots. which should be planted under a hand-glass.

CHRYSANTHEMUM CORONARIUM.

GARDEN CHRYSANTHEMUM.

Pyngenesia. Polygamia Superflua. LINN.

Compositæ. SUD. ORD. *Anthemideæ.* KTH.

This plant is too well known to need description. Its extremely showy appearance in autumn secures for it a place in almost every garden.

Seeds of it may be sown at the latter end of March or beginning of April, either where the plants are to flower, or in pots; if in the latter, the seedlings can be transplanted at pleasure.

CYTISUS MULTIFLORUS.

Diadelphia Decandria. Linn.
Leguminosæ. Jussieu.
Loteæ. Decandolle.

C. multiflorus; caulibus erectis, ramis elongatis teretibus: junioribus villosis, foliolis oblongis basi attenuatis subtùs villosis utrinque concoloribus, floribus subternatis, pedicellis petiolis subæqualibus, vexillo emarginato undulato.

C. elongatus; β. multiflorus. Dec. prodr. 2. 155.

Differt C. elongato, foliis subtùs villosis, concoloribus, nec appressè pilosis, argento micantibus; pedunculis petiolis longioribus v. æqualibus, nec multò brevioribus; vexillo emarginato, undulato, quodammodo lacero, nec obcordato, plano, integerrimo; denique, floribus majoribus, ternis quaternisve, nec subsolitariis, rarò ternis.

This plant is a very beautiful hardy border-shrub, remarkable for the profusion of bright yellow flowers with which its long slender branches are laden. It does not grow above two or three feet high, and is easily propagated by layers. Its native country is unknown.

The differences that exist between this and C. elongatus are as follow:—The leaves are villous and green beneath, not closely downy and silvery; the peduncles are longer than the petioles or as long, and not much shorter; the vexillum is ragged, emarginate, and wavy, not obcordate, flat, and entire; and, finally, the flowers are much larger, and always produced in threes or fours, and not usually solitary, or at the utmost produced in threes.

CANAVALIA BONARIENSIS.

BUENOS AYRES CANAVALIA.

Monadelphia. Decandria. Linn.
Leguminosæ and Jussiem Phaseolea. De Cand.

CANAVALIA Dec.—Calyx tubulosus, bilabiatus, labio inferiore dentibus tribus (vel unico) acutis parvis, superiore lobis 2 amplis rotundatis. Corollæ vexillum amplum bicallosum; callis parallelis; alæ stipitatæ oblongæ auriculatæ; carina dipetala. Stamina monadelphia, aut decimo subadherente. Legumen compressum, tricarinatum, nempè infrà et juxtà suturam superiorem nervo protuberante suturæ parallelo utrinque instructum, mucrone inflexo terminatum, membranis cellulosis inter semina donatum. Semina ovali-oblonga, hilo lineari.—— Herbæ aut suffrutices, ramis volubilibus, foliis pinnato-trifoliolatis. Racemi axillares multiflori pedicellis ternis. Flores ampli purpurascentes.

C. bonariensis; foliolis ovatis obtusis cum acumine coriaceis glabris, racemis foliis longioribus, calycis labio inferiore unidentato.

Caulis lignosus, sarmentosus, volubilis, teres. Folia ternata; foliola petiolulata, ovata, cum acumine obtuso, coriacea, integerrima, glaberrima. Racemi axillares, multiflori, peoduli, glabri, apice leviter pubescentes. Flores gemini, ternive, è gibbis racheos, ad basin sub calyce bracteolis duabus minimis rotundis suffulti. Calyx viridis, campanulatus, bilabiatus, glaber, labio superiore maximo, foliaceo, bilobo, demùm reflexo, inferiore minimo, integerrimo, dentiformi. Vexillum magnum, obcordatum, purpureum, basi limbi callosum, pube quàdam intrà labia calli, abruptè refractum, et inde in ungue acuminatum; alæ falcatæ, obtusæ, vexillo breviores, purpurascentes; carina longitudine alarum, cymbiformis, obtusa, purpurascens, cornubus baseos brevibus, incurvis. Stamina monadelpha, declinata, nullo modo diadelpha; antheris oblongis, utrinque obtusis, alternis demissioribus. Ovarium stipite villoso longo insidens, falcatum, pubescens, heptaspermum, in stylo lineari, ascendente, glabro acuminatum; stigma glabrum, capitatum. (Semen magnum, Wisteriæ frutescentis, sec. cl. Herbertum.)

This is a native of Buenos Ayres, whence its seed was introduced into this country a few years since by the Rev. William Herbert. We find that the stem is woody, and sends out frequently horizontal or drooping runners, which cross along to the furthest extremities of the hot-house, rising up here and there to the top of the building, and again hanging down from the wires upon the rafters.

A tender stove-plant, flowering during most of the summer months. It is propagated by cuttings.

SALVIA INVOLUCRATA.

Diandria Monogynia. Linn.
Labiatæ. Jussieu.

Stem exceeding the human stature, 4-cornered, somewhat shrubby. Leaves cordate-ovate, acuminate, serrated, smooth, with purplish veins. Flowers in capitate thyrses, bright rich purple or lake colour, growing by threes out of the axillæ of large, ovate, deciduous, coloured bractæ. Calyx coloured, 2-lipped; the upper lip acute, entire, the lower shorter, with two obscure teeth. Corolla inflated, smooth, an inch and more long, the helmet downy, the lip rounded, with 3 lobes. Anthers small, white, 1-celled, the connectivum elongated downwards into a sort of semisagittate straight process. Style pubescent.

This very handsome plant is a native of Mexico. It is a most lovely border flower during the autumn months; and in the conservatory it is in blossom during the greater part of the summer. Propagated freely by cuttings, and requires just the same treatment as Salvia splendens.

We entirely agree with our friend Dr. Hooker, in considering S. lævigata of Humboldt and Kunth identical with the S. involucrata of Cavanilles. We do not discover the slightest difference between those two supposed species.

CRATÆGUS HETEROPHYLLA.

Icosandria Di-pentagynia. Linn.
Rosaceæ. Jussieu.

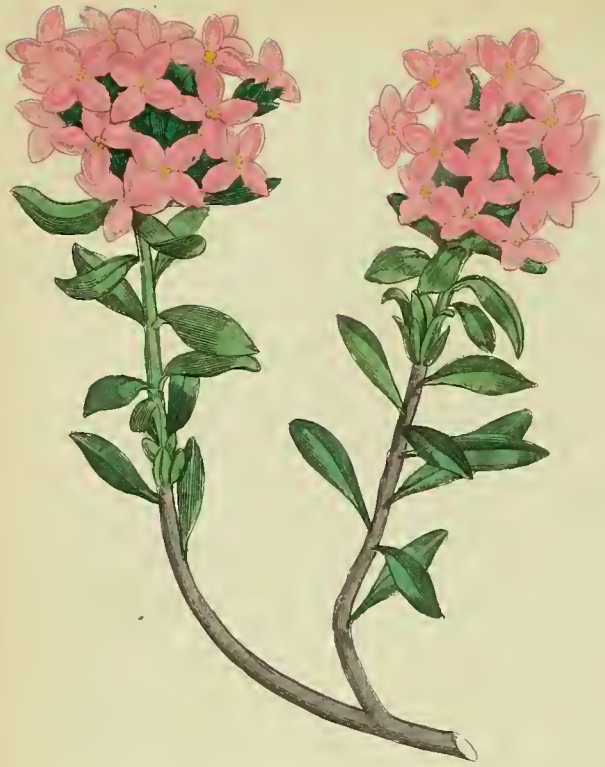
A middle-sized tree, with the habit of C. oxyacantha, but more robust. Leaves lucid, quite smooth, falling off late in the season; near the inflorescence, and on old branches, lanceolate, and quite entire, or oblong, cuneate, 3-toothed at the end; on the more vigorous branches pinnatifid, serrate, somewhat cuneate: stipulæ very large, pinnatifid, half cordate. Cymes many flowered, compact, perfectly smooth. Calyx with a linear-oblong tube, a short campanulate limb, and accuminate, glandless teeth. Petals denticulate, white. Style thick, simple, Fruit black, oval, or fusiform, crowned with the persistent limb of the calyx.

A beautiful kind of Hawthorn, very little known in our English gardens, although it has existed in collections in this country for many years. It is by far the handsomest of the white-flowered species, and is remarkable for its black berries in the autumn.

The native country of this flower is supposed to be North America. but if we consider the litlte affinity that it has with any known North American species, and its close resmblance to C. *maroccana*, it may be safely assumed that it had its origin from the East, as is indeed indicated by one of its garden names.

LIQUORICE PLANT.

The Liquorice plant (*Glycyrrhiza glàbra*) is cultivated in Bourguel, in France, in the following manner:—Trenches, as deep as the soil will permit, and about two feet wide, are opened, three feet from each other; the bottom of the trench is dunged and dug, and two rows of cuttings of the roots are planted as close as possible to its sides; these are covered a few inches, by sliding down a little earth from the ridglet; as the plants grow, more earth is slid down, till, at the end of the first summer, the whole field is level. In the second summer, every pair of rows are carthed up from the wide interval between: during the third summer nothing is done: but in the October or November following, the crop is dug up; and while the ground is being trenched for that purpose, it is sometimes planted as before, for a repetition of the crop. In other cases, a crop of barley, and two succeeding crops of clover are taken; after which, the ground being again trenched, is found to contain a number of liquorice roots; the plant being difficult to eradicate, when the soil and climate are suitable.



1. Daphne encorum.

2. Alyssum saxatile

3. Lithospermum purpureo caeruleum

4. Gazania rigens

5. Nierembergia phœnicea.

6. Tetragonolobus siliquosus.

7. Polygonatum multiflorum.

8. Dianthus plumarius.

9. Gentiana verna.

10. Rosa semperflorens.

11. Stevia purpurea.

12. Erythronium Americanum.

13. Calophyllum Inophyllum L.

14. Anisomeles ovata Br.

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Pitcairnia angustifolia.

ON THE CULTURE OF HYACINTHS.

The Dutch mode of treating Hyacinths was long ago minutely detailed in a work by St. Simon, in which every thing that could be said on the subject will be found. By following out the directions therein laid down, hyacinth flowers fully equal to those obtained from Dutch bulbs, have been produced in this country. The compost used for the purpose at Haarlem is rotten cow dung, rotten leaves, and fine sand. In making this compost, the Dutch gardeners prefer the softer leaves of elm, lime, and birch, and reject those of oak, chesnut, walnut, beach, plane, &c., which do not rot so quickly. The cow-dung which they use is also of a peculiar quality, being collected in the winter, when the cattle are stall-fed upon dry food, without any mixture of straw or other litter. The sand is procured in the neighbourhood of Haarlem, where the soil is a deposit of sea-sand, upon a compact layer of undecayed timber, the remains of an ancient forest which has been overwhelmed by the sea.

The leaves used by the Dutch are laid in a very large heap, in a situation not much exposed to the sun, and not liable to stagnation of water, which is carefully drained from them. When they are decayed and fit for use, the compost is thus made: first, they place a layer of sand, then one of dung, and then one of rotten leaves, each being eight or ten inches thick. These layers are repeated till the heap is six or seven feet high; a layer of dung being uppermost, sprinkled over with a little sand to prevent the too powerful action of the sun upon it. After the heap has lain thus for six months or more, it is mixed, and thrown up afresh, in which state it remains some weeks to settle, before it is carried into the flower beds. This compost retains its qualities about six or seven years; but the Dutch avoid setting hyacinths in it two years successively; in the alternate years they plant tulips, jonquils, narcissuses, crocuses, lilies, &c. in the same beds; nor do they venture to set hyacinths in the compost the first season, when the fresh manure might be injurious to them. The choice bulbs are taken up every year, and the soil that lay amongst the fibres is then carefully brought up to the surface. The beds should be deep enough to prevent a possibility of the fibres coming in contact with the natural soil.

The Hon. and Rev. William Herbert says, that at his villa in Surrey, where he had the advantage of the vicinity of the fine sand of Shirley common, his hyacinth flowers were perhaps superior to those obtained from the best Dutch bulbs, and that he believes English sea-sand, or that got in the neighbourhood of Croydon, will suit as well as that of Haarlem. Where the leaves of elm, &c. cannot conveniently be kept distinct, he imagines that other leaves will serve the purpose as well, if they are left a much longer time to rot; and even old tan, if thoroughly decayed, and pulverised, may be used instead of leaves, since the Dutch have tried it with success. The difficulty in this country is to obtain cow-dung without straw. It may, however, be collected in the fields; but then it is the produce of green food, and very probably not possessed of the same virtue as that used by the Dutch. However, it may with care be gathered from the farm-yard; but it must be completely decayed, so that no portion of straw remain in it half rotten. The mischief occasioned by the fermentation of undecayed straw, and the great heat of horse-dung, &c. is a contagious decay of the bulbs; the cause of which, Mr. Herbert thinks is fungus, the spawn of which is nurtured in the dung. The Dutch, with all their precautions, are much troubled by this disease; the only remedy for which is the removal of the distempered bulb, and the compost that was in contact with it; and the cure of the bulb itself, if the injury has not gone too far, may be effected by amputation of the diseased coats.

The beds should be made about three feet in depth with the compost, consisting of about one-sixth of rotten leaves or tan, two-sixths of pure sand, and the remainder of rotten cow-dung. The compost should not be trodden down hard, but, the bed being opened, the bulbs may be ranged, and then carefully covered from three to five inches deep, but they should not be dibbled or pressed into the compost. The later sorts may be placed nearer the surface, to make them flower earlier. If the situation is wet in winter, the beds may be raised a few inches above the level of the soil; but if too much elevated they will suffer from drought. The Dutch cover their beds with dung or tan in winter, which they frequently put on or take off according to the state of the weather. They like the frost to penetrate to the distance of an inch from the bulb; if it descends deeper, they consider that the blossom will be spoiled, and if it reaches the roots, that they will be destroyed. Mr. Herbert never found the frost injurious in England, even without using a covering, but the winters are severer in Holland.

When the leaves of the hyacinths begin to wither, the bulbs should, if possible, be pulled out of the bed by the hand, to avoid the danger of cutting them with the spade. The leaves should be cut off, and each bulb laid on its side, covering it lightly with the compost, about two inches thick. In this state they should be left about one month, and then taken up in dry weather, and exposed to the open air for some hours, but not to a powerful sun, which would be very injurious to them. They should, after this, be carefully examined, and all the decayed parts removed by a knife, for which purpose it will sometimes be necessary to cut deep.

The bulbs should be placed in an airy store-room about the end of June, but not suffered to touch each other; they should be frequently examined too, in order to remove those which may shew symptoms of decay. Before they are planted in autumn, they ought to be carefully examined, not merely that all the decayed parts, but withered coats may be removed.

Mr. Herbert with much apparent propriety says, that though with greater loss from disease, any nursery-man in the neighbourhood of London may produce hyacinth bulbs equal to those imported from Holland. Nor would he be surprised, if watering the compost before it is used, with salt water or brine, should prove of some use, supposing a fungus to be one of the causes of mischief; for after trying many other things in vain, he found salt to be the only remedy for the tanner's fungus, which is so troublesome in tan-beds, and in the pots of earth in the stove.

ON THE CULTIVATION OF CELERY.

The following method of cultivating celery differs in some points from the usual practice. The seed is sown about the middle of January in a warm situation, on a very rich piece of ground, and is well protected from the inclemency of the weather by mats at night. When the plants are from two to three inches high, they are pricked out into the nursery-bed; and, as they are found to be much injured in their future growth, if the fibres of their roots become at all dry, let them be immersed in a little water placed in a garden-pan, when they are drawn from the seed bed, so that they remain quite moist whilst out of ground. The plants remain in the nursery-bed till they are fit for the final removal, being kept clear from weeds, and watered occasionally. But they should not be transplanted until they become very strong. The ground should be prepared, by being trenched two spades deep, mixing with it in the operation a good dressing of well-reduced dung from the old forcing-beds. That the dung may be the better incorporated with the mould, a second trenching should be resorted to, and then leave it in as rough a state as possible, till the plants are ready to be put out.

In the ground thus prepared, form trenches twenty inches wide and six inches deep, at six feet distant from each other, measuring from the centre of each trench. Before planting, reduce the depth of the trenches to three inches, by digging in sufficient dung to fill them up so much. At the time of planting, if the weather be dry, the trenches must be well watered in the morning, and the plants put in, six inches apart in the

row, in the evening, care being taken, by the mode above mentioned, to keep the fibres quite wet whilst out of ground; as they are drawn from the nursery-bed, the plants are to be dressed for planting, and then laid regularly in the garden-pan. The trenches in which the rows of celery are planted being so very shallow, the roots of the plants grow nearly on a level with the surface of the ground, which seems to be advantageous; for as considerable cavities are necessarily formed on each side, when the moulding takes place, all injury from stagnant water, or excess of moisture, is prevented. The trenches, when planted, are watered as may be required.

It does not seem advisable to load the plants with a great deal of mould at first; the two earliest mouldings should be done very sparingly, and only with the common draw hoe, forming a ridge on each side of the row, and leaving the plants in a hollow, to receive the full benefit of the rain and waterings. When the plants are strong enough to bear six inches height of mould, the moulding is done with the spade, taking care to leave bases enough to support the mass of earth, which will ultimately be used in the ridge, and still keeping for some time in a hollow, as before directed. The process of moulding is continued through the autumn, gradually diminishing the breadth of the top, until at last it is drawn to as sharp a ridge as possible, to stand the winter.

In the operation of moulding, it is necessary, in order to prevent the earth from falling into the hearts of the plants, to keep the outer leaves as close together as possible. For this purpose, before beginning the moulding, take long straws of bass matting, tied together till of sufficient length to answer for an entire row; and fasten this string to the first plant in the row, then pass it to the next plant, giving it one twist round the leaves, and so on till the other end is reached, where it is again fastened. When the moulding is finished, the string is easily unravelled, by beginning to untwist it at the end where it was last fastened.

It is wrong to put much of a crop in the space between the trenches, especially one that grows tall, for celery does best when it grows as open as possible.

METHOD OF GROWING EARLY FORCED POTATOES.

Mr. Thomas Hogg, of Pine Apple Place, Paddington, several years ago raised early forced potatoes at a period of the season previous to that in which they are produced by the usual means of a common hot-bed. The chief peculiarity of the method consisted in using an old cucumber-bed or melon-bed, in which the dung had long lost all its heat, instead of making use of fresh hot dung, whereon to grow the plants. He cut the sets about a fortnight before they were planted; for if they are not sufficiently dried before being put into the earth, they are liable to be much injured by worms. One eye only should be left in each set.

He prepared the bed by removing all the earth from the top of the dung, and covering it about one inch deep with fresh mould, on which the sets were planted in rows six inches apart, and the same distance from each other in the rows. They were then covered four inches deep with mould, and the frames and glasses placed upon the bed, which must be carefully protected from frost. The covering best adapted for this purpose is the second crop of short hay, called *rouen* in the neighbourhood of London.

At the end of the fifth day, the outsides of the old dung must be cut away from near the edge of the frame to the bottom of the bed, in a slanting direction inwards, of about fifteen inches from the perpendicular; strong linings of hot dung must be applied to the space so made, and renewed, if necessary, at the end of three weeks. Air must be given to the plants by sliding down the lights at noon every day that the weather will permit, and water in the mornings, leaving about an inch of the light open, for the admission of air after watering. The potatoes will be fit for use in about seven weeks from the first planting of the sets, and the average crop to each light, if well managed, will be about five pounds. This method Mr. Hogg continued to follow, it is believed, with the success above mentioned. Now, although the taste of the majority will prefer the old and mature root in February to those of such early appearance, yet, independent of the curious nature and result of the experiment, the price paid in London for young potatoes grown in that month, is a proof that they are in sufficient request as an article of luxury, to induce private individuals, as well as market-gardeners, to attend to their earliest cultivation.

To the above successful experiment we may add an account of a mode of continuing a supply of young potatoes throughout the year, which George H. Noehden, Esq. at one time suggested to the Horticultural Society. He says that the potatoe, from the abundant nourishment which the flesh of the tuber affords to the embryo plant, has an extraordinary disposition to vegetate; and that it seems possible to place it in such a situation that the vegetating power, being prevented from exerting itself upwards, so as to form stem and leaves, should be employed in throwing out roots only, with their appendages. This, for example, may be effected, to a certain degree, by laying up potatoes between strata of sand. In the corner of a shed or other sheltered place, or in the cellar, spread a layer of sand, and upon this put some potatoes, then sand again, and so on alternately till you have formed your pile of the height and dimension designed. The top is closed with sand. The strata of sand may be two or three inches deep. In such a pile the potatoes will emit roots and tubers, or, in other words, will yield a young produce: whilst the growing process goes on equally, near the top, in the middle, and at the bottom. Leaves and stem are not seen any where. It is only full grown and ripe potatoes that are fit for this experiment, and such in which vegetation is not impaired by premature sprouting. The old potatoes must be piled according to the times when the young ones are wanted. These will be ready in December, if the pile be formed in August, and thus one month will correspond with another. There can be no difficulty in admitting that one sort of potatoe may be better suited than another to this operation, which experience will soon point out. The *oxnoble* has been recommended; but it is probable that other varieties may be equally fit for this use, or even superior. The produce which is raised by this method is, however, not spoken of as very good; the young potatoes are generally of a loose texture, watery, and of indifferent flavour. This may perhaps be accounted for from the want of suitable nourishment, that would give them proper consistency and quality. The sand can contribute little or nothing towards the matter; and the young roots and tubers must be chiefly fed from the juice and substance of the old. If art could throw in anything to supply what is wanting, good young potatoes are likely to be obtained. What seems to be the best means to accomplish this end would be the application of a proper soil, or compost, in which the old potatoes might be imbedded before the layer of sand is put upon them. But this is a speculation which had not been submitted to experiment by Mr. Noehden at the time he gave the above account. Afterwards, however, it came to his knowledge that young potatoes had been raised in a similar manner to that described and recommended by him; and he remarked that those were the best which had been grown in mould or some sort of compost.

MIGNONETTE THROUGH THE YEAR.

Mr. George Rishon, of the Bedford nursery, Bloomsbury, describes a method of raising mignonette in succession through the year, nearly in the following terms. The demand for this plant in pots at all seasons is so considerable, that particular attention has been given to its cultivation by many gardeners

who supply the London market; and as the same method may be with ease applied to raising it in private gardens, this detail is offered.

To obtain fine specimens of this fragrant annual, strong and ready to blow, during the winter months, and through the months of January and February, the seed should be sown in the open ground at the end of July. By the middle of September, the plants from this sowing will be strong enough to be removed into pots: for a week after this removal, they must be shaded, after which they may be freely exposed to the sun and air, care being taken to protect them by frames from damage by heavy rains, and from injury by early frosts, until the beginning of November. Many of them will now show their flowers, and then they should be removed to a greenhouse or conservatory, or to a warm window in a dwelling-house, where they will branch out and continue to blow till the spring.

The crop for March, April, and May, should be sown in small pots, not later than the 25th of August; the plants from this sowing will not suffer by exposure or rain whilst they are young; they must, however, be protected from early frosts, like the winter crop: they are to be thinned in November, leaving not more than eight or ten plants in each pot; and, at the same time, the pots being sunk about three or four inches in some old tan or coal ashes, should be covered with a frame, which it is best to place fronting the west; for then the lights may be left open in the evening, to catch the sun whenever it sets clear.

The third, or spring crop, should be sown in pots, not later than the 25th of February: these must be placed in a frame, in a gentle heat, and, as the heat declines, the pots must be let down three or four inches into the dung-bed, which will keep the roots moist, and prevent their leaves turning brown from the heat of the sun in April and May. The plants thus obtained will be in perfection by the end of May, and be ready to succeed those raised by the autumnal sowing.

METHOD OF OBTAINING EARLY CROPS OF PEAS, AFTER SEVERE WINTERS.

The following short account of a mode of obtaining an early crop of peas, has been gathered from a paper in the London Horticultural Society's Transactions, furnished by Mr. Knight. When severe winters have proved fatal to crops of peas sowed in the preceding autumn, many gardeners have experienced the advantages of raising other plants in pots, with artificial heat, early in the spring, and subsequently transplanting them into the common soil. But an improvement in the mode of repeating this operation is here described. Mr. Knight says, that in one particular spring his garden, owing to its soil being cold and the climate rather inhospitable, did not contain in the end of February a single living pea-plant, and he purposely delayed the experiment to be explained till the first day of March. Upon that day the ground was prepared, and part of the seed sown, as usual, in rows, where the plants were to remain; at the same time other peas, of the same early kind, were sown in circles within the circumference of pots of ten inches in diameter, inside measure. These pots were filled with a compost of a peculiar kind, from the highly nutritive and stimulating qualities of which he anticipated much acceleration in the growth of his plants, with the advantages of being able to remove them at the proper period to the open ground, without having their roots at all detached from their pasture, owing to the fibrous organic texture of the compost. This was made of equal parts of thin turf, to which much lifeless herbage was attached, and unfermented horse-dung, without litter; and also of a quantity of the ashes of burnt weeds, containing, as usual, a good deal of burnt mould, equivalent in bulk to about one-twelfth of the other materials. Mr. Knight remarks that equal parts of fresh soil, with unfermented horse-dung with litter, and a small quantity of quick lime or wood ashes, would probably operate as powerfully as the compost previously described. The whole of the compost was reduced to small fragments and well intermixed, and the pots were filled with it within an inch of their tops. The peas were then sown upon the surface of the compost, and covered with common mould; and the pots were placed in a peach-house. In this they remained till the plants were an inch high, when they were removed into the open air; but they were protected during the night for some time, and particularly when the character of the evening indicated the probability of frost.

In the last week of March the plants were taken from the pots and planted in rows in the open ground, very near the whole of the compost adhering to their roots, so that their subsequent growth was not apparently checked by their transplantation. They were placed in rows contiguous to those which had been previously sown, a small quantity of compost similar to that put into the pots being added; and the common mould was then closed round their roots, and raised upon each side of the rows. Sticks to support and protect the plants were immediately added, in rather more than the ordinary number and quantity, and subsequently no particular attention was paid to them.

On the morning of the 29th of April Mr. Knight ascertained the comparative growth of his plants, which had been subjected to the different modes of treatment above described, in two rows which grew contiguous to each other, when he found the height of those which had been raised in pots to be fifteen inches, and that of the others to be scarcely four inches; and in May again he remarked that he much doubted if ever he possessed, in the most favourable season, as forward a crop of peas as at that date. On the 27th of June the full result of the experiment was seen. The plants so treated had produced a very abundant crop, and at least twelve days earlier than those sown at the same time in the usual manner, and with a much more rapid succession of produce.

Many causes appear to have operated in conjunction to produce the effects described by Mr. Knight. It has long been known that snow does not lie so long upon ground which has been manured in the same season with fresh unfermented horse-dung, as upon unmanured ground; and therefore it may be concluded that some degree of heat existed in the compost, and emanated from it, though probably never to the extent of being felt by any warm-blooded animal. If placed in a heap, such a compost as the one described, and even when the horse-dung is much less in quantity, will heat violently. If heat, says Mr. Knight, was in any degree generated by the compost in which the peas grew, the escape of it was necessarily retarded by the numerous sticks by which the ground was partially covered, whilst little injury could have been sustained from their shade, because the quantity of light comparatively with the temperature of the air and growth of the plants is very great after the vernal equinox, and it is every day increasing in power and influence.

Another cause of the rapid growth of the transplanted peas has probably been the very favourable state of the soil in which they had been placed, which had been turned over with the spade immediately before transplantation took place; for peas never thrive well in strong soils, when such have been compressed and soddened in early spring by much moisture. But the chief causes of their very rapid growth must have been the highly nutritive and stimulating quality of the compost, and the presence of some degree of additional warmth. Mr. Knight mentions that he has frequently derived great advantage from placing a moderate quantity of nearly similar compost immediately under rows of peas which have been sown in the usual way, except that the seeds were placed upon the surface of the soil within which the compost had been buried, and covered by having had the soil collected from each side, to form a ridge over them. In all cases where a compost of the kind described is employed to accelerate the growth of dwarfish and early peas, it should be used in small quantities only, that the early growth

of the plants may be promoted without excessive and consequently injurious luxuriance being given. For transplanted peas Mr. Knight prefers a poor and light soil, so that the roots may be led, as they will be under such circumstances, to confine themselves to narrow limits, and the plants consequently brought to an early maturity.

THE PHYSIOLOGY OF PLANTS.

The scientific inquirers into the phenomena of nature, which have of late years figured, are neither few in number nor mean in accomplishments. Still they may be divided into two classes, upon one important ground. There is a class which, till lately, seemed to enlist into its ranks the most illustrious names; whose reasonings and conclusions, whether disingenuously conducted or not, we must not at present assert, opposed, directly or indirectly, many statements in the Bible, from which the most peculiar doctrines of the Christian religion in a great measure depend. This class, from its numbers, the names it could boast, and the fashion in science which it established, became so formidable, that he who confessed himself a Christian, was laughed at, when he added the term Philosopher. For the days of Newton, Locke, and Boyle had gone bye. But the nation and Europe can now, we are happy to say, point with triumph to a second class, who, if their researches have not found out so many new facts as the scorners did, can, with the most complete power, turn, or rather apply those facts to the illustration and enforcement of sacred truth.

Within a very late date, there have been many of these sacred ministers employed in teaching us the true philosophy, who have not dimmed or disfigured the most brilliant facts by a cold and heartless infidelity, but who have made us to behold the power, the goodness, and the wisdom of the Creator more clearly than ever, and to perceive our own imperishable nature, rights, and ends, in a manner that, while he is exalted, we are enlightened. The writers of the Bridgewater Treatises have acted effectually in this department, with many other authors whom we could name. The little work before us, which has been for some time in the hands of the public, belongs to the same able and benevolent school. We do not say that it teaches new truths, or that it will yield much information to him who has previously made a study of the science of which it treats. But it is capable of doing something no less important. For from it, the unscientific reader will derive much of the riches which have been discovered, and these set in an advantageous and attractive light.

The author is an enthusiast, as well as deeply versed in the physiology of plants. It is not the mere nomenclature of plants he cares about, but the history, the structure, the uses, and phenomena of vegetation in its endless variety and beauty: each and all engage his ardour; an ardour which has been unremitted, as we learn from him, for many years. And as we have before hinted, he finds and exhibits the whole as manifestly declaring wisdom and contrivance that are from above. As introductory to the extracts we are about to submit to our readers, we add, that as a graceful, enthusiastic, and enlightened manual, we recommend this little volume to every general reader, be he old, or be he young.

The work is divided into thirteen chapters, in which the structure, attire, and composition of plants are first treated of. The root—the stem—the blossom—seeds—phenomena of germination—secretions—vegetation—light and electricity in relation to plants—and their age, are all separately, clearly, and engagingly discussed. We string together a few extracts taken from this intelligible and agreeable arrangement of the subject.

"The bark, wood, and pith, are general terms, comprehending the mechanical structure of the trunk and twig, or branch, the ramification of the stem. The epidermis is a thin film, which covers the bark, and forms a defence from external injury. In the birch, when in an advanced stage of growth, it is white and silvery, easily recognised even at a distance, and thus adds a peculiar feature to the landscape; it peels off readily in thin laminæ. In the aucuba japonica, or gold plant, the epidermis is yellow; it is, however, generally colourless, and occasionally transparent. In leaves, the epidermis possesses a reticular or net-like structure, and the meshes of the tissue vary in different plants, but are fringed at the edge by spiral vessels. In reeds and grasses it contains much finely divided silicious matter; hence, two portions of ratan cane emit sparks by collision; and the equisetum hiemale is used to polish wood, and employed by the Swiss, among the vallies of Switzerland, &c., as a substitute for sand-paper, in their beatiful models of Swiss cottages and dairies. A stem of barley may be fused into a transparent globule, and lightning has converted the hay-rick into a vitreous mass. The equisetum has been used to give a keen edge to the razor; and the Dutch reed in polishing, derives its efficiency from the same source; also the teazle, dipsacus fulonum, employed by the clothier to raise a regular pile or nap on the surface of the cloth. Mr. Knight sharpens razors from the ashes of the *Elymus arenarius*, and other marsh grasses; also the ashes of wheat. Stedman mentions, that there is in Surinam a species of grass, the edge of which cuts, like a razor, the legs of those who pass through it: the edges of the *Scleria grandis* are as sharp as glass. No doubt, tropical forests and jungles are often set on fire by the collision of the silicious matter of the ratan and other canes, when shaken with the wind. The epidermis clothes the most delicate petals of the flower, as the foliage, the stem and the root. It seems to be altogether distinct and peculiar, is pervious to light, and is at the same time an absorbent and exhalent membrane, as well in its relations to moisture, as to gaseous media. It is probable, that these composite functions are connected with the presence and absence of light, and increase or decrease of temperature: with both of these electricity is connected."

We pass over the author's observations on the bark and wood, and call the reader's attention to one of the uses to which the pith of plants has been devoted:—

"From the *pith* of the papyrus antiquorum were formed the papyri of Egypt, found in the sycamore (ficus fatua) coffins, the dormitories of mummies, as well as those recovered from the ruins of Pompeii and Herculaneum. The 'paper reeds by the brooks,' are mentioned in the prophetic records, several centuries before our era: the papyrus still clings to such spots among the marshes of Egypt, and the Delta of the Nile; and forms a beautiful ornament on the banks of the Anapus: that found among the swamps, near the ancient Syracuse, seems to be a variety, if not a distinct species; and M. Lippi states his having found two species different from the true papyrus antiquorum of modern botanists. The cyperus papyrus of Linneus rarely exceeds ten feet in length, which is about that of a specimen in my possession, though Pliny says the root was as thick as a man's arm, and that the plant occasionally exceeded fifteen feet in height. Its stem is imbricated, of a triangular shape, and tapers towards the summit. The head of the papyrus is composed of a tuft of small grassy filaments, about twelve inches long; toward the middle, each filament separates into four, and in the partition are four branches of flowers, not unlike an ear of wheat, but forming a soft and silky husk. The flower of the papyrus was used in ancient times in religious ceremonies. We have seen a very fine and tall specimen of the papyrus antiquorum in the lecture room of the Botanic Garden of Edinburgh, growing in a vessel of water. This celebrated plant supplied the paper or writing material of ancient times: and, in the natural history of Pliny, we are supplied with a description of the process employed for making paper: the papyrus was separated into thin slices, by a fine point; these were brought into contact by their edges, transverse slips were again superposited on them, with their edges

in similar contact; this done, the mass was sprinkled with Nile water, and submitted to pressure. This ancient paper, which became an important branch of Egyptian commerce, especially with the Roman Empire, and in the reign of Augustus, we have every reason to believe was thus formed. If we hold up a specimen of Egyptian papyrus between the eye and the light, the ribs may be seen parallel, and crossing each other at right angles. We have seen two specimens of modern papyri, manufactured by the Chevalier Landolina, of Syracuse, by a process similar to that described by Pliny, in which the medulla, or pith, was employed, *not* the external rhind of the reed, as has been generally supposed. One of these specimens I saw at the Studio of Naples; the other in the British Museum, with a description of the process in Italian, both presented by Landolina. I have compared each of these with Egyptian papyri, also with those recovered from Herculaneum, and there can be no doubt that the process employed has been the same. Dr. Schouw, of Copenhagen, supplied me with a detail of the process communicated to him personally by Landolina, and it is substantially what has been stated. I have myself tried the same experiment successfully, on a small scale. The paper formed from the paper reed was in high estimation in the time of Alexander the Great. Ptolemy Philadelphus king of Egypt, when he commenced his library, and collected an immense variety of books, had them copied on this kind of paper. In his reign, considerable quantities of the paper were exported, which was, at length, however, prohibited, to prevent the king of Pergamus from establishing a rival library. Paper made from the papyrus was principally manufactured at Alexandria, and the city was considerably enriched by the exportation of this paper. Vopiscus mentions one Fermies, who boasted that he could maintain an army from the value of his stock of paper: when it began to be disused is not certainly known; as late as the fifth century it was in general use in Europe, and in Italy and France, was continued to the eleventh and twelfth centuries."

On roots, which serve as the anchorage of the plant, and their capillary tubes, by which the plant is sustained, as also on the diversity of forms which the roots of different plants assume, he is lucid and entertaining. Mark the power of this portion of the objects treated of.

"The power of the vegetating root is sometimes astonishing; it will grasp pebbles, and completely weave a fibrous web round them. M. Paiot had experimentally shown, that the radicles of seeds, when germinating, were capable of penetrating mercury. A seed of the lathyrus odoratus, the cotlydous of which do not unfold themselves during the act of germination, was placed one-fifth of an inch from the metallic surface, previously moistened; germination took place, and when the radicle reached the mercury, it pierced, and buried itself within its substance. Dr. Butler, of Shrewsbury, informed me that he had supplied a number of peach and nectarine trees, trained to a wall, with a quantity of bones, by way of manure: some years afterwards, he had occasion to remove the wall, and when the fruit trees were taken up, the roots were found completely investing the bones, and in numerous instances the tips of the roots adhered, like so many suckers, to the surface of these bones, the tips being flattened in contact with the bone. The root of the couch, or squitch-grass, will pass through the solid tuber of a potatoe; but I am not acquainted with a more extraordinary instance of the force of vegetation, in reference to the couch-grass, than the following:—In taking up last November, some bulbs of the tyger lily, I found two of them completely threaded by the repent root of this grass, so that the bulbs, were monoliform, or like beads on a string. The roots of the laurel will overturn a wall; and in Needwood Forest, I have seen the holly luxuriant on the summit of a venerable oak, its roots having cleft and penetrated the stately trunk—and, in Alpine regions, the calcareous and gigantic rock has been rent in twain, by the penetrating root, as by a wedge. This tremendous force would no doubt be partly occasioned by the infiltered water, which would follow the root, the rent having been begun, in the first instance, by absorbed moisture, &c. We have been informed that the root of mint grows much more rapidly during night, than by day; the plant for the experiment was reared in a glass of water."

What heart is there which swells not with noble sentiments when he beholds a stately tree? Those here spoken of must have been noble *fellows*, and worthy to sentinel a mountain for ages.

"Lewis and Clarke report that the pines on the Columbia river exceed the height of 300 feet. According to Mr. D. Don, a distinguished botanist, the purple-coned fir of Nepal, found at an elevation of from 8,000 to 10,000 feet above the level of the sea, is a magnificent pine. 'This, which may be regarded,' says Mr. Don, 'as the silver fir of Nepal, surpasses all others of the fir tribe in beauty: its lofty and pyramidal form; its numerous, long, erect, cylindrical purple cones, studded with drops of pellucid resin; and its flat leaves, silvery underneath, and of a bright shining green above, which thickly adorn its ash-coloured branches, render it a truly picturesque object: the trunk is from 70 to 80 feet high, perfectly straight, covered with a somewhat smooth grey bark, and having a circumference of seven or eight cubits.'

"Not to mention the venerable oaks of huge diameter, in this country, and many of which we have seen, the boabab *(adansonia digitata)* has been found 77 feet in circumference, and even in solitary cases, 100 feet, while the altitude of the stem seldom exceeds 15 feet. The chesnut, on the flanks of Etna, called *custagno di cento cavalli*, measures one hundred and eighty feet, and though now in fragments, it is unquestionable that these stems were once united. Professor Schouw, of Copenhagen, informed me that he had the question distinctly ascertained, by having the earth removed around it, and found the entire trunks united below ground into one. The dragon-tree at Oratava, in the island of Tenerife, is 48 feet in circumference. According to Labillardiere the largest cedar on Mount Lebanon is nearly 28 feet in circumference. An oriental plane, in the valley of Bajukdere, near Constantinople, has a cavity of 80 feet in circumference. The tree at Huahine, called by the natives *aoa*, described in Bennet and Tyerman's 'Voyages and Travels,' is probably a mangrove, judging from the description. The girth of the trunk of this cloistered tree is stated to be 70 feet. The banian of the Nerbuddah, notwithstanding the invasion of the waters on its territories, is still upwards of 2,000 feet in circumference round its principal stems. Some years ago, the bole of a large black walnut tree was brought from Lake Erie, in America, to this country, and we believe is still exhibited in London: it measured 36 feet around, and was excavated and furnished as a sitting room."

"The flower or corolla," says the author, "is that painted physiognomy by which the plant is recognised, and referred in the Linnean arrangement to its individual station among the tribes of vegetation." We take notice of this definition merely to show that the writer is no friend to the *natural system*, which he calls "the most *unnatural* jumble of incongruities that ever were collocated together." But of the part in question—

"Pliny, with rare felicity, characterized the flower as the 'Joy of Plants,' *Flos gaudium arborum*;—the rose, the amaryllis, and the tulip are splendid attestations to this poetic truth. The corolla is adorned with all the coloured imagery of the prism, sometimes singly, at other times mingling its chromatic rays together on one disc, as if the rainbow had impressed its beauteous seal on the fair canvass of the flower. At other times we find the flower of dazzling whiteness, unrivalled even by the snow. 'To paint the lily,' is proverbial for what cannot be improved; and who would dare to do it? Besides its showy ornaments, the fragrance of the flower, as in the rose, is not less delightful, though there be some that cannot so well com-

pete for the distinction; but the incense of flowers is often wafted afar on the breeze, particularly remarkable in the spice islands, the approach to which is announced at an immense distance at sea.

"These beautiful insignia of trees consist individually of a variety of parts, all contributing their share to the perfection of the whole: the bractæa, or floral leaves, sufficiently conspicuous and distinct in the artichoke, are sometimes present, and at other times absent; sometimes they are green, as in the case referred to, as well as hypoxis erecta; or they are coloured, as we find them to be in the examples already cited. In the hartzia coccinea, the bractea are a bright scarlet; in the tilia europea, a pale yellow; and in the salvia hormium, a beautiful purple. The bracteas are more permanent, usually, than the calix: the chalix or flower-cup is commonly the colour of the leaf, as in the pink and carnation; though it is also occasionally coloured, of which the fuschia coccinea or common fuschia, affords a beautiful example; the scarlet, or rather crimson envelope, being a true calix, while the rich purple fillet it encloses is the corolla.

"The corolla is usually distinguished from all other parts of the plant by its rich and brilliant drapery—it is frequently white, but usually painted with the most exquisite colours, and sets all art at defiance to imitate. One example of a green flower has been given; the flower of the daphne laureola is another of the same kind.

"The variety in the forms of the corolla of plants is as countless as its hues: it is of one piece, as the bignonia or convolvolous, and of an elagant bell shape in the lily of the valley, convallaria majalis—

'The silver mistress of the vale!'

or, composed of numerous segments or pieces, as in the white or orange lilies. The palms exhibit that peculiar form of corolla, called the spatha or sheathe, of which the beautiful white fillet of the cala ethiopica, forms an elegant type: the personate or masked, and the ringent corollas are singular and curious: the snapdragon and monkey flower will readily occur as examples. Among these are to be found the lobelia cardinalis and fulgens, as well as the salvia splendens; rich and dazzling in the attire of their corollas. But in point of singularity of structure, they are surpassed by several of the orchideœ; in the fly orchis, ophrys muscifera, the flower so much resembles a fly, that it might be readily mistaken for one."

Speaking of seeds, the following passage regards a wonderful contrivance for the propagation of objects not endowed with locomotive power.

"The dispersion of seeds also supplies us with a chain of curious contrivances, admirably suited to the purposes for which they are designed; and it is a subject of regret, that these singularly constructed species of mechanism have not been so minutely investigated, as the interesting subject merits; well might Forskal say! 'Miro, nec adhuc investigato mechanismo propelluntur semina.' The capsule of the violet will project its contained seeds to a distance of several feet; and the elastic arillus of the wood sorrel will eject them over a considerably greater space. The euphorbia coccum (Grœtner) is also remarkable in this respect, as well as some of the ferns, which possess an elastic ring for the purpose; geranium, fraxinella, and others. The crackling of the capsules of furze in a warm summer day must be familiar to many, and is sometimes the only sound which breaks the stillness of the landscape. The scales which enclose the seeds of pines sometimes open suddenly, and disperse their contents. The noise occasioned by this mechanical impulse on the air, may be often heard at a considerable distance: 'This crackling voice,' says Mr. Keith, 'was observed and traced to a fir-tree, namely pinus, pinea at Kendlesham parsonage, on July 14, 1808, by two young gentlemen, my pupils, who thought the tree was bewitched, till the cause of the noise was pointed out to them.' A species of wild cress, cardamine impatiens, suddenly unfolds its seed vessel, on being touched. I have, when handling the plant, and more minutely examining the structure and elastic apparatus of the seed vessels, been temporarily deprived of vision, by the impulsion of the seeds into my face. The balsam, *balsamimum*, is not less curious than the rest of these, and has been not inappositely, from the elastic force employed by the seed pod in the dispersion of its contents, called 'touch me not.' In these cases, the power of the projectile seems to reside in the elasticity of the valves of the capsule."

An imposing and venerable idea is suggested by the age which some sort of trees reach to, that, joined with the stately and gallant appearance already spoken of, leads us to remember, and not to marvel, that they have been considered hallowed and sacred in heathen countries. We can feel something like respect for an aged tree, and wonder less how kindred sentiments would guide a benighted pagan. We would walk many a mile to look on one of those described below. We would strive to embrace it, and address to it, with head uncovered, a soliloquy regarding the olden time.

"There were, in 1776, in the palace garden of Grenada, several cypresses, which formed a cypress grove, and computed to be eight or nine centuries old.

"Pliny mentions a plane tree in Lycia, hollowed out into a cave, eighty feet in circumference; there is an oriental plane in the valley of Bujukdere, near Constantinople, which embraces a circuit of 150 feet, and has a cavity of eighty feet circumference. The oriental plane of Stanchio, an island in the archipelago, formerly Cos, is remarkable for its size, and no doubt has a corresponding age. Earl Sandwich, in 1739, measured forty-five paces from the trunk to the extremity of the branches; these branches are supported by pillars of marble, verde antique, and porphyry; and though time has assailed it, it is still immense. 'Some notion,' says Dr. Clarke, 'may be formed of the time those props have been so employed, by the appearance of the bark: this has encased the extremities of the columns so completely, that the branches and the pillars mutually support each other: and it is probable, if those branches were raised, some of them would lift the pillars from the earth.'

"There is a yew tree at Peronne in Picardy, which was known to be flourishing in 634; it still existed in 1790, consequently was 1156 years old: there is also an Italian fig, in the Isle of Thanet, supposed to have been introduced by the Romans in the first century. The yew near Staines, at three feet high is nine feet three inches diameter, and the extent of its branches embrace a circle of 207 feet: that it is of a very considerable age there can be no doubt.

"Eight olive trees still remain on Olivet, said to be 800 years old; and it is ascertained that they existed prior to the capture of Jerusalem by the Turks. Mount Lebanon, and the range of the Taurns, are the native soil of the cedar of Lebanon. It is a magnificent and beautiful tree, and several very venerable and noble specimens still decorate the flanks of Lebanon. According to Labillardiére, the largest of these patriarch trees is at least nine feet in diameter. The trees are still held in great esteem, and an annual festival is celebrated beneath their shade, called the 'feast of cedars.'"

We conclude by telling our readers that this little volume contains learning, research, talent, and sound philosophy, put forward in the most agreeable style. In truth, it is a delightful book; and more especially so, as there is a spirit predominating in every paragraph, which shows that the author is a man of enlightened piety; and to whom there is

"Not a tree, a plant, a leaf, a blossom,
But contains a folio volume,"

written in testimony of the goodness, wisdom, and providence of God.

—o—

ROYLE'S HIMALAYAN BOTANY.

Several months ago we took up the two first parts of this splendid work, on the botany and other branches of natural history, as presented in the regions of the Himalayan Mountains and in Cashmere, which are amazingly rich in such productions; and we now proceed to the third and fourth parts, which have since been published, that our readers may have a taste of what is therein contained. We shall first of all abridge part of the introduction, embracing general and geographical details, which continues to form a considerable portion of the third part, and serves to guide the mind with greater precision and interest to the scientific points afterwards discussed.

Though extensive tracts of the Himalayn remain unexplored, the uniform result of every observation establishes the great elevation of this chain of mountains. Captain Herbert, speaking only of the surveyed portion of them, observes that there are no fewer than twenty-eight peaks in the Himalayas which overtop Chimborazo in South America. But to form a true estimate of these mountains it is necessary also to take into consideration their breadth as well as length, and enormous height. This is supposed to be greatest in the vicinity of the lofty peaks near which the principal rivers have their rise. Crossing from the plains of Hindoosthan to the snowy passes, the distance is not less than 80 or 100 miles. In no part is there any thing like table-land to be found; but seen from the plains of Northern India, the Himalayas appear formed of a succession of parallel ranges, though nothing of this kind is apparent when we enter the mountains themselves, for in ascending any of the principal points, a number of arms are seen radiating in every direction, separating deep ravines, connecting the different mountains together, and throwing the waters of the several rivers in opposite directions. Notwithstanding this irregularity, the ridges generally run parallel to the direction of the mountain mass; for in proceeding transversely across it, we have constantly a series of ridges to ascend and descend, and narrow vallies to cross.

Crossing these mountains, the descent on the side of Tibet, according to the concurrent testimony of all travellers, is gradual, and not of great extent, though the ascent up the southern face had been so considerable. It is evident, therefore, that the land on the northern face is much elevated. The different aspects, climate, heights, and soils of this immense region, must consequently afford a prodigious variety of natural productions.

The parts now before us of the work we are considering are devoted to botany, and describe several orders of great commercial value. Take of Lineæ the following species:—

"*Lineæ.*—This order, named from, and chiefly composed of the genus Linum, of which one species has been known for its important uses from time immemorial, is found chiefly in Europe and the north of Africa, but also in most other parts of the world, though not very numerous in species any where. In India one species, L. Mysurense, has been found in the Peninsula, and by myself on the Mussooree and Kedarkanta mountains. At the foot of the hills, and at moderate elevations within them, are found the different species, L. Cicanoba, trigynum, repens, and tetragynum, which are all distinguished by the showiness of their flowers, are closely allied among themselves, and differ from the rest of the genus. Mr. Bentham suggests that L. repens is only a variety of L. Cicanoba. This I have found varying so much, that even L. trigynum, of which the older leaves, as Dr. Roxburgh mentions, are serrate, may be a variety of it, as well as L. tetragynum.

"In the plains of India, Linum usitatissimum is found every where in a cultivated state in the cold weather months. This plant, so well known for the tenacity of the flax yielded by its fibrous bark, from which, in the present, as in the most ancient times, linen cloth was manufactured, and which is subsequently converted into paper, is valuable also for the mucilage yielded to water, and the oil to pressure, the first by the covering, and the other by the almond of its seed; while the residue forms an oilcake fit for the food of cattle. Flax, extensively cultivated in Europe, is imported into England, chiefly from Russia; and linseed from both America and Holland. In Egypt, as in ancient times, it is much cultivated in the present day; it must long have been introduced into India, probably from the northward; but its names do not give us any assistance in tracing it to its source; as the Sanscrit atasee, Hindee atees, Bengalee mushina, have no resemblance to the Hebrew pishtah, Arabic akshoot, Greek λινον, or Persian kutan. The latter, remarkable for its resemblance to qootn or kutun, the Arabic name of cotton, but this is written with the Arabic, and the former with the Persian kaf. In India the flax is cultivated only on account of its seed, of which the mucilage is valued as a demulcent in medicine, and the oil in the arts; but the plant, which in other countries is most valued, is there thrown away; and others, such as Hibiscus cannabinus and Crotalaria cannabina, are cultivated almost in the same field, for the very products which this would yield. It seems worthy of experiment, therefore, to ascertain whether a valuable product might not be added to the Indian agriculturist's profits, without much additional expense. Flax having been manufactured into linen cloth, both by the Egyptians and the Hebrews, as we learn from the sacred writings, as well as from Herodotus, and know from the mummies being exclusively, as far as hitherto ascertained, wrapped up in linen clothing, it is curious that the practice of converting flax into linen should not have passed into India. This, I conceive, can easily be accounted for by the latter possessing the cotton plant, of which the weavable portion is more obvious, elegant, and well suited to the climate."

In addition to what we have in another number extracted from this work on the cotton plant, it will not be unacceptable that we should present, on a subject so important to England as well as to India, some further observations on the species or varieties which are cultivated in different countries, with the view of leading to improvements in its cultivation. But here there are great difficulties to encounter, as botanists have generally neglected the subject, and omitted mentioning the cultivated species, while cultivators have used provincial names, or applied new ones of their own, to the exclusion of any notice of the names in use among botanists. The celebrated De Candolle has admitted thirteen species, observing that they are all uncertain, whilst Dr. Roxburgh has added two, and others have described a great many more. With the assistance of the observations of this last-mentioned gentleman, who states that he had studied the subject for thirty years, and some other eminent botanists, the author hopes that the following kinds, cultivated in different countries, has been by him referred to their true species.

"1. G. obtusifolium (Roxb.) Shrubby, very ramous. Leaves small, with three, rarely five, obtuse, ovate, entire lobes. Stipules falcate. The exterior calyx with entire divisions. Capsules ovate, cells three-seeded. Seeds free, and clothed with firmly-adhering, short greenish-gray down, under a small portion of ash-coloured wool.—Roxb. Fl. Indica. vol. 3, p. 183. A native of Ceylon, but not cultivated. Flowers during the rains and cold season in the Botanic Garden at Calcutta.

"2. G. acuminatum (Roxb.) Sub-arboreous. Leaves from three to five lobed, lobes oblong, tapering, very acute. Exterior calyx deeply lacinate. Stipules linear-lanceolate. Capsules long, ovate, much pointed. Seeds many, adhering firmly to each other, black, and free of every pubescence, except the long white wool, which is easily removed.—Roxb. Fl. Ind. 3, p. 186.

"Dr. Roxburgh states that this species is easily distinguished by its superior size and large black seeds, which adhere firmly to each other. It is said to be a native of the mountains to the north and westward of Bengal, but he does not find that it is ever cultivated; but it is apparently a species well worthy of trial in different parts of India, as it is indigenous, and desirable on account of the facility with which the wool separates from the naked seeds.

"3. G. herbaceum (Lin.) Stems woody, bi-triennial, 4-6 feet high in tropical), herbaceous and two feet high, in temperate climates, the older parts reddish, the younger, as well as the flower and foot-stalks, hairy, frequently marked with black spots. Leaves hairy, palmate, 3, generally 5-lobed, in herbaceous varieties, lobes broad and rounded with a little point; in those which are woody sub-lanceolate and acute, with or without glands. Stipules falcate-lanceolate. Flowers axillary, generally solitary towards the extremities of the branches, petals of a lively yellow colour, with a purple spot near the claw. Segments of the exterior calyx or involucel, D.C. cordate at the base, margin dentate, sometimes entire. Capsules ovate, pointed, 3 or 4-celled. Seeds free, about five in number, clothed with firmly-adhering, grayish down, under the short-staple white wool.—Xylon s. Gossypium antiquorum.—G. herbaceum. Linn. sp. Pl. 3. p. 355. Lamarck Encycl. 2. p. 133. Cav. Diss. 6. p. 310. t. 164. f. 2. Wild. 3. p. 803. Roxb. Fl. Ind. 3. p. 184. D.C. Prod. 1. p. 456. This and its varieties are by far the most generally cultivated in India. Dr. Roxburgh particularly distinguishes three varieties:—1st. Dacca Cotton, which furnishes that fine long soft cotton-wool, employed in manufacturing the very delicate beautiful muslins of that place. v. Roxb. Corom. Plants. vol. iii. t. 269. 2d. Berar Cotton, distinguished by growing to a greater size, and having smooth and straight branches, leaflets of the exterior calyx more deeply divided, and the wool of a finer quality than in the common variety of this species. This is cultivated in Berar and the Northern Circars, and with its cotton the fine Madras, more properly Northern Circar, long-cloth is made. 3d. China Cotton, introduced into Bengal, where its wool, according to Dr. Roxburgh, is reckoned 25 per cent. better than that of Surat. Lamarck's G. indicum. Encycl. 2. p. 134. Capas, Rumph. Amb. 4. p. 33. t. 12. Dr. R. says, is no doubt one of these varieties; Cavanilles (Diss. 6. p. 314. t. 169.) having seen it in flower in Paris, was of the same opinion. The variety cultivated about Cawnpore and in the Doab, is figured tab. 23. fig. 1. from a drawing in General Hardwicke's collection. There are also specimens from Saluen and Tavoy."

The Tiliaceæ are closely allied with the Malvaceæ, the order which embraces the cotton-plant, and like it includes species that are turned to important practical purposes :—

"*Tiliaceæ*.—The Tiliaceæ, though named from an European timber-tree, are chiefly found in tropical countries. The genera Corchorus, Triumfetta, and Grewia, of which numerous species are found in India, are also abundant in the warm parts both of Africa and America; and as has been remarked with the plants of some other families, many of the same species are found in the most widely separated parts of India. Grewia betulæfolia, with Corchorus linearis and fascicularis, extend from the Peninsula up to the arid region on the western bank of the Jumna, where a new species, C. prostratus, is also found. Corchorus capsularis and acutangulus, as well as Triumfetta angulata, are common at Saharunpore, as in the most southern provinces. In the tract of jungle and forest, which clothes the foot of the Himalaya, we have several of the species which are found in similar situations in Bengal and Assam, as Triumfetta æstuans, Grewia helicterifolia, tiliæfolia, and sapida, which is apparently the same as G. pumila, Don, and G. nana, Wall. Triumfetta oblongata extends as high as Jureepanee, or five thousand feet above the sea; and Corchorus humilis (nob) shews itself fifteen hundred feet higher up, but both only during the rainy season. Grewia sclerophylla, didyma, oppositifolia, and elastica, are found in the Kheree Pass, in the Doon, as well as higher up within the Himalaya, particularly in the neighbourhood of villages.

"As we have seen with the Malvaceæ, and the other allied orders, so are the Tiliaceæ remarkable for mucilaginous properties, as well as for tenacity of fibre; and several species of the genus Grewia have pleasantly-tasted acid berries, as was found among the Malvaceæ, in the fruit of Hibiscus Sabdariffa. Corchorus olitorius is in India, as in Egypt, used as a pot-herb, and is in Bengal cultivated for the fibres of the bark, which are called jute and pat. C. capsularis is likewise cultivated in Bengal as in China, for the same purpose. Its fibres, as well as those of C. olitorius, are employed in making a coarse kind of cloth, called tat, of which gunny, or rice-bags, are made; also a coarse kind of linen worn by the poorer people in some parts of Bengal, as we are informed by Dr. B. Hamilton; of it also the cordage employed in agriculture, and for rigging boats, is formed, and it is the material from which paper is made. The inner bark of Grewia oppositifolia, as that of Tilia, or lime-tree, is in Europe, is employed for the same purposes, at lower elevations within the Himalaya; and the leaves of some species, as of G. didyma, are given as fodder to cattle, and are even stacked up for winter use. As the wood of the lime-tree is valued for its close grain, lightness, and smoothness, so Berria Amomnilla, or Trincomalee wood-tree, affords timber, valued also for its lightness and strength, and is employed in the construction of the excellent Massoola boats of Madras. Grewia elastica, figured at Pl. 22, called dhamnoo by the natives, and common in the Himalayas in northern latitudes, at moderate elevations, affords timber which is highly valued for its strength and elasticity, and therefore much used for bows, buggy shafts, and bangy sticks. Some of the species of Grewia, as before mentioned, yield pleasant acid berries, much used for making sherbet. Of these, G. asiatica may be instanced as common in gardens; but G. sapida, helecterifolia, sclerophylla, and others, are used for the same purpose."

Of some of the plants that belong to the order Ternstræmiaceæ we shall take occasion to refer to this work at another time, on account of their extensive commercial interest. At present, however, we quote the scientific notices of the author respecting the family generally :—

"Of all those which belong to this family, the tea-plant is alone of any commercial importance, but this in so pre-eminent a degree as to render it a most desirable acquisition to other countries. An inquiry into its history and habits, therefore, becomes interesting, that we may ascertain whether it be so local and peculiar in its nature, as to render futile any attempt to introduce it elsewhere. To do this satisfactorily, it will be necessary to enter into some detail respecting the varieties or species which afford the different teas of commerce, the extent of their distribution, the climate, soil, and culture, which they prefer, as well as the plants with which they are associated, either in a wild or cultivated state.

"The tea-plant has been supposed to be indigenous in the mountains which separate China from the Burmese territories; but we are informed by Dr. Abel that he found a small shrub, of what is commonly considered the green variety, apparently in its natural habitat, and near no plantation, at See-chou, in the province of Kiang-sea, about N. lat. 26 deg., where the hills were covered with pines. Thunberg states that tea grows every where in Japan, both naturally (*sponte*) and cultivated, on the margins of fields. One species, so named, is described by Loureiro, as found both cultivated and in a wild state, in the northern provinces of Cochin-china; and the same author describes T. oleosa as common about Canton, both wild and cultivated. To the kindness of Mr. Reeves I am indebted for the information that there is a species of Thea, growing wild in the neighbourhood of Macao, which is much larger in the leaf than either the black or green tea plants.

"But it has been made a question, whether the varieties of tea known in commerce are due to difference in species, or only to differences in soil, climate, culture, and mode of preparation. The latter appears to be the opinion of Kæmpfer, Thunberg, and Siebold, as they admit of but one species of Thea, and is that now generally entertained; Thunberg notices two varieties of Thea bohea, but says they can hardly be distinguished into species. Siebold says that the variety viridis of T. Chinensis, D.C., is a shrub every where cultivated in Japan; but the variety bohea he had only seen in gardens, introduced from China. From this fact one would be inclined to conclude that

they were distinct; and as all the observations were made in Japan, it is probable they all three only saw one species cultivated there: as there is reason for believing, that the opinion of Linnæus that two species of Thea yield the teas of commerce, is the more correct.

"Dr. Abel, when passing through the tea country, had little doubt of there being two species of tea-plant; but he could not at the time define the character, and was unfortunate in losing his specimens in the shipwreck of the Alceste. But he mentions that the plants from the black and green tea districts differed in the form, colour, and texture of their leaves; those of the green tea being larger, thinner, and of a lighter colour than those of the black, though growing in the same soil: these differences he also observed in a large plantation near Macao. Dr. Hooker, in the Botanical Magazine, t. 3148, has given the characters of the two species. Thea viridis, which is the species figured, he describes as 'a large, strong-growing, almost hardy, plant, with spreading branches; its leaves three to five inches long, very broadly lanceolate, pale green, singularly waved, with the margin reflexed; the flowers large, solitary, mostly confined to the upper axil. These appear in autumn, six weeks or two months earlier than those of T. bohea, which is of smaller size, with remarkably erect stiff branches; leaves not above half or two-thirds the size of the former, perfectly flat, more coriaceous, of a dark green, bearing in the axils of numerous leaves two or three flowers, which are smaller, and have a slight fragrance; and are in perfection during winter. This plant cannot withstand the frosts of an English climate.'

"Mr. Reeves, whose opinions, from his long residence in China, and attention to subjects of natural history, are entitled to the greatest weight, is the most recent author who has referred to this subject; and he expresses his surprise 'that any person who has been in China, or, indeed, any one who has seen the difference in the colour of the infusions of black and green tea, could suppose for a moment that they were the produce of the same plant, differing only in the mode of curing; particularly as they do not grow in the neighbourhood of each other.' (*Loudon's Gard. Mag.*, vol. ix. p. 713). To this opinion, it will be seen, he still adheres, as in a letter with which I have been favoured, he informs me that he believes that the Thea viridis of the gardens is the plant from which the green tea of commerce is prepared, and that the plant which produces the black tea of commerce, as souchong, congou, &c. is not so common in England. Both may be seen in great perfection in the Messrs. Loddige's rich and extensive nursery-grounds at Hackney, where a green-tea plant has lived for many years in the open air. The first impression on seeing them, is that of surprise at their ever having been confounded; as nothing can be more distinct than the large, membranous, light green, wavy leaf, with large and irregular serratures, and straggling habit of the green-tea plant, from the smaller, flat, thick, and coriaceous, dark-green leaf, with small and even serratures, and erect port of the black tea. Both plants have been figured in Loddige's Bot. Cab. t. 226 and 227, and the characters well given, as also in the above extract from Dr. Hooker. I would only add, that the flowers, though commonly, are not always single in the axils of Thea viridis; and this, though earlier in flowering, is not so much so as described. The green tea being the hardier is cultivated, as we shall see, in the northern, and the black tea in the southern provinces of China. The former is the only kind cultivated in Japan, according to Siebold, and is that figured by Kæmpfer, Amœn. Exot., p. 607.

"Notwithstanding the above opinions, and the distinctness in the characters of the two species, as above given, there is an unaccountable discrepancy in the statements as to the plants which afford the green and black teas of commerce, especially as Dr. Abel, after giving his opinion that there were two species of tea-plant, mentions that 'from persons perfectly conversant with the Chinese method he learnt that either of the two plants will afford the black or green tea of the shops; but that the broad thin-leaved plant is preferred for making the green tea.' (Journ. to China, p. 222).

"This is in conformity with the information communicated to Dr. Hooker, and also with that originally given by Mr. Pigou (As. An. Reg. 1802), on the authority of a Chinese, who had been eight times in the bohea country, remaining there from four to six months each time, and who stated that 'bohea may be cured as hyson, and hyson as bohea.' To this Mr. Reeves replies in the letter to which I have alluded, that 'the Chinese manufacturers do not, and *they* say they cannot convert black tea into green, and *vice versa*, and this I believe to be true; indeed, the colour of the infusions is alone sufficient evidence.' The discrepancy in the information Mr. Reeves explains, by adding that 'there is a species of tea grown in the province of Canton of a pale-coloured leaf (occasionally mixed with congou tea, to make the tea imported under the name of bohea), and this tea can be coloured and made up to imitate various qualities of green tea, and large quantities are yearly thus made: but still it is only an appearance that can be given: the deception is detected as soon as it is put into water.' Owing, no doubt, to these mixtures is the difficulty in detecting the two kinds of leaf in the teas of commerce; but in good teas they may be distinctly recognized. Dr. Abel's information having been obtained from hearsay at Canton, most probably refers to the kind described by Mr. Reeves, as he most particularly distinguishes, and lays down on his map, the green and black tea districts; but arguing upon the correctness of the information he had obtained, concludes that the differences observed may be produced by a due management of the heat used in drying the plant. Mr. Millet's account, Mr. Reeves says, he himself knows refers to some of this tea.

"A very important consideration being to ascertain the climates in which the tea-plants are chiefly cultivated, it is necessary, in the first instance, to determine the extent over which they are distributed, before we can form any idea of the degree of heat and cold to which they are subjected. Dr. Abel states, that 'the green tea district in the province of Keang-nan is embraced between the 29th and 31st degrees of north latitude, and is situated on the north-western base of a ridge of mountains, which divides the provinces of Che-kiang and Keang-nan. The black tea district, in the province of Fokien, is contained within the 27th and the 28th degrees of north latitude, and is situated on the south-eastern declivities of a ridge of mountains, dividing the province of Fokien from that of Keang-see.' p. 223. Hence we perceive that the districts have both a north-western and a south-eastern aspect, and that Dr. Hooker's statement that the Thea viridis is able to withstand the greater degree of cold, is confirmed by the fact of the green teas being procured from the more northern latitudes. This has reference to the teas usually manufactured for foreign trade, and is conformable to the information given by Mr. Reeves (Bot. Mag. l. c.), who states that 'the black teas are chiefly grown in the N.W. corner of the province of Fokien, in about lat. 27 deg. 50 min., long. 1 deg. 30 min. E. of Peking, and the green tea in the southern part of Keang-nan province, about lat. 29 deg. 58 min., long. 2. deg. E. of Peking.' At Hwuy-chow-Foo in the latter, the greater proportion of hyson and twankay is manufactured, and the black teas at Gan-ki-hien in Fokien. By Mr. Reeves I am further informed, that in a Chinese Herbal, in which the plants used in medicine are described, tea is said to be produced (among other places to the northward of 31 deg.) in nine places in Hoo-Qwang, three places in Ho-Nan, one place in Shensi, and two places in Shantung; one of these latter, and the most northward of the whole, is Tang-chow-Foo, in 36 deg. 30 min. north lat. From Kæmpfer, Thunberg, and Siebold, we learn that the tea-plant is extensively cultivated in the islands which form the Japanese territory; and these extend from 30 to 41 deg. of north latitude. It is also cultivated in the southern province of Yunan, whence we learn from Du Halde and Sir G. Staunton, the tea is procured, which is made up into balls; and likewise at Ho-ping in the province of Quang-tung; Dr. Wallich further mentions, that it is also

cultivated in Cochin-china, as far south as 17 deg. of north latitude.

"But as from the information obtained by Sir G. Staunton, we learn that the tea-plant thrives best between 23½ deg. and 30 deg., and as the principal cultivation of the best teas for the foreign trade is between 27 deg. and 31 deg. of north latitude the space included between these forms a belt, which will serve as a criterion of the soil and climate best suited to this plant. With respect to the former, Dr. Abel gives the only precise information I have been able to obtain, and he states that from every account given of the tea-plant, it succeeds best on the sides of mountains, where there can be but little accumulation of vegetable mould. The plantations which he saw were always at some elevation above the plains, in a kind of gravelly soil, formed in some places by disintegrated sandstone, and in others by the debris of primitive rocks. A large and flourishing plantation of all the varieties of the plant brought together by Mr. Ball, the principal tea-inspector at Canton, is situated on an island close to Macao, in a loose gravelly soil, formed by the disintegration of large grained granite. 'Judging from specimens,' Dr. Abel continues, 'collected in our route through the province of Keang-nan, whence the green tea is procured, its rocks consist chiefly of sandstone, schistus, and granite. As to what may be the exact nature of the rocks of the black tea country in the province of Fokien, I have no precise information. But as the great ridge separating that province from Keang-si is a continuation of the one dividing the latter from Canton, it is perhaps legitimate to conclude, that their constituent rocks are the same; and that the hills and soil on the eastern are the same as we found them on the western side of the ridge, or that they are covered by a soil like that in which the Camellia flourishes.' (Abel, p. 224). This is most likely to be the case, as Sir G. Staunton states that a chain of granite mountains begins at Hangchoo-foo, with a direction to the southward, and that vast tracts of hilly land are planted with tea in the province of Fokien. Mr. Reeves, from the views he has of Soo-Ei-Shan, where the best black teas are grown, suspects that the hills are schistose.

"With regard to the climate of this tract of country, or that best suited to the cultivation of the tea-plants, we are without precise information, as no one competent to make observations has resided throughout the year in the principal tea districts; but the approximative results we are able to obtain will, perhaps, be sufficient for practical purposes, particularly if connected with a view of the vegetation. In the first place, if we look at the tables which have been calculated, and those of Mr. Harvey are the latest, we shall find the probable mean temperatures of Canton, of the parallels of latitude of 29 deg. and of 31 deg., as well as of Pekin, to be 74.73 deg.; 72.62 deg.; 69.86 deg.; and 62.43 deg. respectively. But it is desirable to have these theoretical results confirmed by practical observations, especially as temperature is not invariably found to go along with latitude, particularly with regard to the eastern and western sides of continents. This the illustrious Humboldt has long ago shewn in his paper on Isothermal lines: where he has remarked that 'the whole of Europe, compared with the eastern and western parts of America and Asia, has an insular climate, and upon the same isothermal line, the summer becomes warmer, and the winters colder, in proportion as we advance from the meridian of Mont Blanc towards the east or the west; the western parts of all continents are not only warmer at equal latitudes than the eastern, but even in the zones of equal annual temperature, the winters are more rigorous, and the summers hotter on the eastern, than upon the western coasts of the two continents. The northern part of China, like the Atlantic region of the United States, exhibits excessive climates (as Buffon indicated) and seasons strongly contrasted, while the coasts of New California and the embouchure of the Columbia, have winters and summers almost equally temperate. Thus we find at New York, the summer of Rome and the winter of Copenhagen; at Quebec, the summer of Paris and the winter of Petersburgh. In China, at Pekin, for example, where the mean temperature of the year is that of the coasts of Brittany, the scorching heats of summer are greater than in Cairo, and the winters as rigorous as at Upsal.' These results have been deduced by their illustrious author from the observations of Amyot, which were carried on for a period of six years: by these it appears that Pekin, in N. lat. 39 deg. 54 min. and E. long. 116 deg. 27 min., and at the level of the ocean, has an annual mean temperature of 54 deg. 9 min., that of the warmest month being 84 deg. 38 min., and of the coldest 24 deg. 62 min.; while the mean temperature of the three winter months is 26 deg. 42 min. The severity of the cold may be judged of by this, and by the thermometer sometimes falling, it is said, as low as 63 deg. below zero, as well as by the great thickness of the ice with which the rivers are frozen over. The summer is as warm as that at Naples, with a mean temperature of 82 deg. 58 min., and the greatest heat as high, it is said, as 121 deg. The mean temperature of the three spring months is 56.30 deg., and of those of autumn 54.32 deg., but it frequently freezes in both March and November; the mean temperature, however, of seven months is above 51.8 deg., or that of the months in which trees vegetate that lose their foliage. The temperature of the spring months being of March 41.4 deg., of April 57.0 deg., of May 70.3 deg., and of June 84.2 deg.: the increase of the vernal temperature and the differences between these four months are seen to be very great, and very equal (15.7 deg., 13.3 deg., and 13.9 deg.) as characteristic of climates where the division of the annual heat between the seasons is very unequal. (Humboldt on Isothermal lines. Brewst. Journal, vol. iii. iv.)

"In some works it is stated that there are properly only two seasons at Pekin, summer and winter, or the seasons of snow and rain. The months of June, July, and August, are stated to be very rainy, and the average of rainy days to be fifty-eight. The climate of the northern provinces must, however, be considered a dry one, as we learn, from both Sir G. Staunton and Dr. Abel, that large stacks of salt are left in the open air, on the banks of the Pei-ho, covered only by bamboo matting under a coating of clay. The showers are described as being light; no indications of a damp atmosphere are mentioned, but heavy dews occur in the evening. The season in which China was visited by Lord Macartney's embassy was peculiarly dry, as it is mentioned that from July to November scarcely a shower had fallen, and the country had been traversed from Zhehol to 30 deg. of N. latitude. Lord Amherst's embassy also, which arrived on the Pei-ho on the 12th of August, had hardly any rain until the beginning of November, when they had got into the tea country. Le Compte also mentions a drought which had continued for five months in the year he arrived in China. The foregoing view of the climate of Pekin, though more severe than what the tea-plant is subjected to, will serve as an approach to a true estimate of the extremes of temperature which it is capable of bearing, as it is cultivated in 36½ deg. north, and also in Japan.

"As an indication of a southern climate where the tea-plant is cultivated, and the only one of which we have any account, it will be useful to refer to the following view of the climate of Canton furnished by Mr. Reeves to Dr. Lindley. I have deduced the mean temperatures from the maxima and minima; the results, therefore, though somewhat too low, cannot be very far from the truth. The range of the thermometer, and its means in the several months at Canton, are: in

	Jan.	Feb.	Mar.	Apr.	May.	June.	
Maxima	74	78	82	86	88	90	
Minima	29	38	44	55	64	74	
Means	51.5	58	63	70.5	76	82	
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
Maxima	94	90	88	85	80	70	
Minima	79	75	70	57	40	45	
Means	86.5	82.5	79	71	60	57.5	69.7 Mean annual temperature.

"The cold weather months, or from November to February, are fine, dry, and bracing, with a range of the thermometer from noon to night of 10 deg. and 20 deg., the prevailing winds being N. and N.E. February is cold and rainy, March warm and foggy. In April and May the weather is warm, but pleasant, with variable winds, chiefly from the S. and S.E. In June and July there are often heavy showers with thunder, lightning, and occasionally typhons. During these two months and in August, the thermometer attains its highest elevation, but seldom exceeds 90 deg. The heat, however, is very oppressive to many; for at the latter part of this period, when the wind is westerly, there is little variation of the thermometer night or day, a sufficient indication of the moisture of the climate during this season.

"It would be desirable to know the quantity of rain which falls, but the only register that I have met with is one kept at Macao, and appended to the above thermometrical register of Canton. The climate is much the same in the two places, with the exception of a much smaller range of the thermometer at Macao, as might be expected in an insular climate; for though the heats are nearly as great in the warm months, the fall of the thermometer at night and in winter is much less. The quantity of rain which falls at Macao, on an average of eighteen years, is about 69½ inches annually—107 inches is the largest, and 49 the smallest quantity which fell in any year. Some rain generally falls in almost every month, though comparatively little from November to March; about five inches in both April and October, and about ten inches in each of the months from May to September, both included. If we compare the climate of Canton with that of Calcutta, which is not a degree to the southward, we shall find that with a maximum temperature of 93.6 deg., 3.6 deg. above that recorded at Canton, the minimum is only 56.8 deg., being 27.8 deg. above that at Canton; and while the mean temperature of the latter is 69.7 deg. (74 deg. according to some), that at Calcutta is above 78 deg.

"But as a great part of China, with a portion of the tea districts, has been traversed by the two British embassies, it will be useful to refer to the thermometrical observations which were made, though only for a short period of the year. The only meteorological register saved from the shipwreck of the Alceste, was that kept by Dr. Lynn during Dr. Abel's illness, from the 8th September to the 24th November, that is, from Tiensing, near lat. 39 deg., to Nanchang-foo, about lat. 28 deg. 40 min., which is about the northern extent of the black tea, and the southern limit of the green-tea district. Previous to this, and while at Tung-chow, nearly in N. lat. 40 deg., Dr. Abel observes, that Fahrenheit's thermometer from 20th August to the 2d of September, frequently stood in the shade during the day at 88 deg., rose once to 93 deg., and never fell below 83 deg. In the night it generally fell to 72 deg. and 70 deg., and the weather felt chilly. From the above register, it appears that the range of the thermometer was: in the

	Morning.	Noon.	Evening.
Province of Pechelee, from 8th to 15th September	65° to 70°	77° to 82°	76° to 80°
Province of Shantung, from 16th Sept. to 2d Oct.	54 — 64	72 — 80	66 — 77
Province of Keangnan, from 3d to 18th Oct.	54 — 65	65 — 76	— 70
Province of Keangnan, from 18th to end Oct.	56 — 62	60 — 72	
Province of Keangnan, Tea-plant first met with, from 2d Nov. to 13th	52 — 63	54 — 76	
Province of Kiangsee, from 13th Nov. to 24th	44 — 62	50 — 58	

"If we compare the range of the thermometer in the two latter periods, or during the month of November, when the embassy passed from 31 deg. to 28 deg. 40 deg. of N. latitude, as before, with some place in India, we shall find that Saharnupore, in lat. 30 deg., and elevated 1,000 feet, approximates in climate during this month, as the thermometer ranges from 45 deg. to 55 deg. in the mornings, and from 60 deg. to 84 deg. at the hottest time of the day, which is always, at least, two hours after noon. If we suppose the decrease of temperature to be only equal to what takes place at Saharnupore, we shall have a mean temperature of 52 deg. in the coldest month, January; with the thermometer sometimes down to the freezing point, and ranging up to 65 deg. in the warmest part of the day: but the extremes we know must be greater from what takes place both at Canton and Pekin, on account of the eastern exposure of China. This is confirmed by Mr. Reeves, who informs me that 'snow has been on the ground for days together upon the green teas, and the manufacturers of the black tea complain of the coldness of their country at times.' With respect to moisture, we have seen that the largest proportion of rain falls at and near Canton, while the sun is in the neighbourhood of the tropic of Cancer; so that there may be said to be a rainy season there, though not so decidedly as in Bengal; and Mr. Reeves has known the black-tea manufacturers complain 'that their first picking (in May and June) often suffers from rain and cold easterly winds.'

"These few indications of the climate being premised, it would be interesting to connect with them a precise idea of the vegetation; but this is hardly attainable, as so little is known of the interior of China, from the want of competent observers of the localities of plants; but there is no doubt that the vegetation must differ in the northern and southern provinces, and also where these consist of elevated lands or of plain country. From Du Halde, and the progress of the British embassies through the provinces of Pe-che-lee, Shan-tung, and the northern portion of Kiang-nan, we learn that from Tien-sing nearly to Nankin, or from N. lat. 39 deg. to about N. lat. 32 deg., and in a S.E. direction to the termination of the grand canal at Hang-chen-foo, the country consists of level and extensive alluvial plains, rich and highly cultivated; intersected by numerous rivers and canals, and covered in some places with extensive swamps and broad lakes. In the most northern parts of this tract, with many genera found in temperate and European climates, we find some plants which we should expect to find only in more southern latitudes, as Lagerstræmia indica, Ipomæa Quamoclit, Celosia cristata, Gomphrena globosa, species of Gynandropsis, Tribulus, Clerodendron, &c.; the lakes abounding with Nelumbium speciosum, Trapa bicornis, Pontederia vaginata, and others; while the fields are cultivated with rice, millet, cotton, sesasum and castor-oil plant. Sida tiliæfolia, referred by Dr. Roxburgh to S. abutilon, affords fibres for rope-making; and the gardens capsicums, gourds, melons, and water-melons, the egg-plant, yams, and sweet potatoes, with species of Soja, Dolichos, and Lablab, all of which are also cultivated in every part of the plains of India.

"As the two embassies separated at the great river Yang-tse-kiang, and both shortly afterwards met with hilly country, as well as with the tea-plant, it is necessary to notice both, and more in detail than we have done above. Lord Macartney's embassy found a chain of granite mountains extending southwards from Hang-chen-foo, about lat. 30 deg. 20 min., on each side of the river Che-tang-chaung, along which they proceeded after issuing from the grand canal. Here they found the large-leafed chesnut, and the towering larch; the purple-leafed tallow-tree growing near, and the shining-leafed camphor-tree further from the water, with Thuya orientalis in the valleys. About lat. 29 deg. 40 min. the banks receded from the river, and were chiefly cultivated with sugar-cane in the neighbourhood of groves of orange-trees. About this part of the route they were supplied with grapes, oranges, apples, pears, chesnuts, walnuts, pomegranates, melons, and a kind of date, as well as the Chinese

fruits see-chee (Diospyros) and lee-chee (Euphoria). On the sides of the hills, pines were met with, and on the sides and tops of earthen embankments, dividing the gardens and groves of oranges, the tea-plant was first seen growing like a common shrub, and along with it the oil-plant or Camellia oleifera.

"Lord Amherst's embassy having taken the direct route to Canton, proceeded up the Yang-tse-kiang first to Nankin, and then along the sides of the Poyang lake, to Nan-chang-foo, where the two routes united. In the neighbourhood of Nankin they found the country become hilly, fir-trees were first seen, and the cultivation of the mulberry and tallow-trees with that of rice and cotton. Near that town Dr. Abel found Rosa Banksiana, Cotyledon spinosa, Hamamelis chinensis, and Ficus repens abundant, as well as Pinus chinensis (Pinus Massoniana, Abel), with Salisburia adiantifolia. Near Tatung, about lat. 31 deg., which they reached on the 2d of November, where the country was hilly and picturesque, the chief interest was owing to the plants. The tallow-tree was abundant, and the tea-plant was first seen; the barometer on the river stood about 30.13 deg.; but on the hills close to it five species of oak were found, among them Quercus densifolia and chinensis, dwarf chesnuts, and among the many ferns Pteris piloselloides. Much ginger was also grown here. A few days' further progress brought them to the confines of the province of Keang-see; near this they found the tea-plant cultivated on the hills, which also abounded with oaks and fir-trees; and near the banks of the river there was extensive cultivation of rice, cotton, and bamboos.

The province of Keang-see, which in its northern parts is flat, full of rivers and marshes, and in winter has a mean temperature of 60 deg. (Enc. Metrop. Art. China) the embassy traversed along the borders of the Poyang lake, of which the neighbourhood is hilly, and covered with plantations of oaks and firs, to which were now added Cunninghamia sinensis (Pinus lanceolate) and Abelia chinensis. There were considerable quantities of the tallow, varnish, and camphor-trees. At Nan-kang-foo, situated about lat. 29½ deg., at the foot of a lofty mountain, of which the top was covered with snow, which melted next day, pines were seen at the greatest elevation. The barometer on the river stood at about thirty inches, so that the neighbouring country must be about the level of the sea, and the banks were covered with rice, cotton, and bamboo, and with them were cultivated Arum esculentum and Arachis hypogæa. On the hills many ferns were found, as species of Adiantum, Asplenium, Aspidium, Blechnum, Davallia, Polypodium, Pteris, and Woodwardia; an Ilex allied to I. aquifolium, Pinus chinensis, several species of oak and the tallow and camphor trees.

"At Nan-chang-foo, the route of the two embassies becomes again united. From the 24th November to the 18th December Lord Amherst's embassy proceeded up the river Kankiang, which flows into the Poyang lake; the banks were chiefly composed of red sandstone, resting on granite; when low, cultivated with rice, sugar-cane, bamboo, camphor-tree, and a Ficus, much resembling the banyan tree; and when high, with the oil-bearing Camellia, or C. oleifera, which was first met with by Dr. Abel shortly after leaving Nang-chang-foo, bearing abundance of flowers in November, varying in height from six and eight feet to that of a moderate-sized cherry-tree, and flourishing best in a red sandy soil; deer, pheasants, and partridges were seen; and a woodcock at Quachow. The sugar-cane was observed ready to be cut down, and great fields of wheat were springing up. On the 6th December, Pinus chinensis and Cuninghamia sinensis were again met with; and on the 8th at Seechou, about lat. 26 deg., the tea-plant was found apparently wild; in the neighbourhood of Elæocoecus verrucosus (Dryandra cordata) and Eugenia microphylla. Beyond this, were extensive plantations Camellia oleifera, where Eurya japonica was abundant.

"On the 20th December, they crossed the Meiling Mountain, which divides Keangsee from Quantung, where groves of fir-trees skirted their way; and a species of Prunus was seen in full flower at the top. On descending from this, they entered the province of Canton, which at first they found mountainous and barren, but shortly met with groves of Pinus chinensis, intermixed with Cunninghamia sinensis. The vegetation on the surface of the hills least decomposed, consisted of the species of Lycopodium, which resembles a tree in miniature. A few days after passing Chau-chou-foo, which is situated near the 25th parallel of latitude, they found the neighbourhood of their anchorage hilly, and very abundant in wild plants. Myrtus tomentosa was of great size, and very abundant, Smilax China, famed for its sudorific properties, scarcely less in quantity; with another species, like S. lanceolata. A Begonia, resembling B. grandis, was also found growing to the height of twenty feet; and a wild species of Camellia, which Dr. Abel considered to be probably a variety of C. oleifera; while the rocky banks of some small streams were covered with species of Marchantia and Jungermannia. Two Rhexias of douhtful species grew in the rocks, with several plants of questionable genera. (Abel, p. 199). Plantations of sugar-cane were frequent in this part of their route, as well as in the southern portion of the province of Kiang-see. As they approached Canton, groves of orange-trees, of bananas, and of the rose-apple, relieved extensive fields of rice. A great extent of this province towards the coasts consists of level plains, and though so near the tropic, the winters we have seen are severe; ice is sometimes formed, hut snow does not fall: owing, however, to the general mildness of the climate, and the alternations of hot and cold months, two crops, as in India, are annually obtained; and sugar, rice, and cotton, cultivated, as well as an inferior kind of tea. The fruits consist of oranges and shaddocks, bananas, pine-apples, and jack-fruit; with those which are peculiar to China, as the lee-chee, longan, wampee, &c.: grapes, pears, prunes, chesnuts, and peaches, are also found, hut do not ripen well. In a garden near Canton, Dr. Abel found the Moutan Paeony, Camellias, Azaleas, and roses, with the black and green-tea plants, which he also saw in a plantation at Macao; as well as Vaccinium formosum, the tree like Lycopodium, and the dwarf elm. The province of Fokien, which is celebrated for the production of the best black tea, lies to the northward of the province of Canton, between the tropic of Cancer and 28 deg. of north latitude. It is mountainous, hut warm and healthy. The mountains are terraced, and covered with firs: the cultivation consists of rice and sugar, and in the cold season of wheat; oranges, lee-chees, and longans are abundant.

"From the above few notices of the temperature and vegetation, though during only a portion of the year, in some of the provinces of China, we may perceive a considerable resemblance to what we have seen to be the characteristics of the Flora of India and its mountains: that is, considerable uniformity in these respects over an immense extent of plain country, and a rapid change from a tropical to a European vegetation, whenever we begin to ascend the mountains. But this is a more remarkable occurrence in China than in India, as its plains stretch into more northern latitudes, and the extremes of temperature between winter and summer, as well as the differences in this respect between the northern and southern provinces, is much greater than in India. But if we enter more particularly into details, we shall find that this resemblance in the vegetation and cultivation of different provinces with one another, and of all with India, is almost entirely confined to annuals. Such plants, cultivated in summer, are subjected everywhere to nearly similar degrees of heat; while those which constitute the winter crops, meet only with congenial cold. But the perennials of mountainous situations, as well as those of the northern provinces, being exposed alike to the severity of a Chinese winter and the heats of summer, which, though great, are excessive only for a short time, resemble the plants of northern latitudes, and such as are found on the slope of the Himalaya: belonging to such genera as Pinus, Taxus, Juniperus, Cupressus, Quercus, Betula, Populus, Salix, Celtis, Ulmus, Æsculus, Castanea, Morus, Fraxinus, Syringa, Tilia, Acer, Rhododendrum, Andromeda, Azalea, Rhus, Juglans, Pyrus, Prunus, Cratægus, Cydonia,

together with Berberis, Sambucus, Viburnum, Lonicera, Evonymus, Rhamnus, Ilex, and Staphylea; and among herbaceous plants, many Ranunculaceæ, Fumariaceæ, Cruciferæ, Caryophyleæ, Rosaceæ, Sempervivæ, Umbelliferæ, and Primulaceæ; as well as species belonging to the genera Viola, Erodium, Geranium, Hypericum, Ruta, Lythrum, Saxifraga, Chrysosplenium, Rubia, Galium, Linaria, Hyoscyamus, Statice, Plantago, Iris, Lilium, Allium, Convallaria, and Paris. With these genera are associated others, of which the species are most prevalent about the centre of the temperate zone, and to which great extremes of temperature may be supposed to be obnoxious, as Pistacia, Olea, Punica, Cercis, Nerium, Oleander, Papaver Somniferum and Rhoeas; and others, of which the species are chiefly diffused through tropical countries, as Melia, Diospyrus, Sterculia, Grewia, Zanthoxyium, Acacia, Tamarix, Indigofera, Lespedeza, Hedysarum: but of these only single species have in general been enumerated in the northern provinces of China, in the same way that we have seen species of the same genera, extending to the most northern parts of India, and ascending up the sides of the Himalaya within the thick covering of jungle and forest, when they could not exist in the moderate cold even of the open places of Northern India.

"But the great resemblance of the Flora of the mountains, and of the northern provinces of China and Japan, is to that of Europe, as may be inferred from the existence in each of the above genera and a number of the same species; as Humulus Lupulus, Chelidonium majus, Hyoscyamus niger, Hedera Helix, Lithospermum arvense. Thlaspi arvense, and Capsella Bursa Pastoris; with several others, which are likewise found in the mountains and north of India. But as the north of China forms the southern boundary of Tatary, which indeed terminates only at the range of mountains, over the vallies and across the ridges of which the great wall is built, we may expect to find in the province of Pe-chee-lee, many of the plants of the Tatarian and Siberian Regions, which are themselves nearly identical in genera, but distinct in species, in consequence of the greater dryness of the former: but all these have a considerable resemblance in being subjected to great dryness and great extremes of heat and cold. Hence we meet with many of the plants of Pallas, Ledebour, and others, as included by Bungé in his enumeration of the plants of China. (Mem. De l'Acad. Imp. des Sciences de St. Petersbourg). As for instance, Clematis angustifolia, Delphinium grandiflorum, Menispermum dauricum, Papaver nudicaule, Viola variegata, Amygdalus pedunculata, Potentilla supina, bifurca, soongorica, and fragarioides; with Astragalus adsurgens and melilotoides, and species of Caragana, Oxytropis, and Patrinia, which are characteristic of these regions; with many others, as Serratula centauroides, Aster tataricus, Scorzonera radiata, Apocynum, and Cynanchum sibiricum, Gentiana squarrosa, Convolvulus subvolubilis, Iris dichotoma, Lilium tenuifolium, and Asparagus maritimus. As Kunawur forms the western limit of the Tatarian region, we have some of the plants which extended into it from more northern latitudes, found also in this part of China, as Ranunculus salsuginosus, and Sysimbrium Sophia. And as some resemblance was shown to exist, in appearance at least, between the plants of Kunawur and those of Delhi, we have some of the genera of the latter in the province of Pe-che-lee, as Ailanthus, Lycium, and Salsola. Thunberg has long ago remarked, that in Japan the cold is great in winter, and the heat considerable in summer; and that its botany resembles that of the north of China: this is fully confirmed by a comparison of his Flora with Bungé's list. He at the same time alluded to the affinity with the Flora of Northern America: this may be seen in the prevalence of the genera Magnolia Illicium, and Gleditschia. Panax pseudo-ginseng, found by Dr. Wallich on Sheopore in Nepal, differs but little from the American P. quinquefolium, which is supposed to be the same as the plant yielding the Chinese ginseng; some species are identical, as Veronica virginica, Ribes Cynosbati, and Datura Stramonium; of which the last, as well as the genera Chaptalia and Ampelopsis, has been found in America, China, and the Himalayas. Between the two latter, however, the analogy in genera is the greatest; and even some species which were first discovered in the Himalayas are now enumerated in the Flora of China; as Evonymus micranthus, Fraxinus floribunda, Rhamnus globosus (R. virgatus? Roxb.), and Convallaria cirrhifolia; while others, which were only known as Chinese and Japan plants, are found in abundance within the Himalayas, as Houttuynia cordata, Hovenia dulcis, Ophiopogon spicatus and japonicus, Kadsura japonica, Hastingia coccinea, Murraya exotica, Hypericum patulum, Spiræa callosa, Viola prionantha Bge, Lonicera japonica and chinensis, with Daphne cannabina, and many others.

"In conjunction with such genera as were first enumerated, it may excite surprise to see so many annuals and such cultivation as we expect to meet with only in tropical countries; but this is far from surprising, when we consider that the temperature of the summer months diminishes but little, and in some places rather increases with the latitude; as Bruce, in Abyssinia, found the climate on account of the rain 12 deg. cooler when the sun was over-head, than when 36 deg. distant to the southward. Thus, at Calcutta, the temperature of the three warmest months, April, May, and June, is 85.05 deg., and of the rainy months, July, August, and September, 82.83 deg.; at Benares, in N. lat. 25.18 deg., the mean temperature of the first period is 90.99 deg., and of the second 83.01 deg.; and at Saharunpore 84.3 deg. and 82.3; while at Canton, in the three warmest months, it is 83.6 deg., and at Pekin 82.58 deg.; while at the last, the temperature of no less than seven months, is above 51.8 deg. Hence we find the lakes in the northern as in the southern provinces, abounding with Nelumbium speciosum and Trapa bicornis, and like those of India with Euryale ferox, and species of Nymphæa, Pontederia, Sagittaria, Utricularia, Myriophyllum and Leersia. Saururus supplies the place of Aponogeton; Phrynium capitatum employed in making the excellent Calcutta mats, is found in both countries. Species of Scirpus, as in India, yield tuberous roots, which are used as food; and species of Typha, Acorus, Lemna, Ceratophyllum, and Menyanthes, and are found as in more northern latitudes; while in the plains of the northern provinces, as we have seen, many tropical plants occur. In the central provinces, as we learn from the list given by Sir G. Staunton of the plants found in Shan-tung and Kiang-nan; we have such tropical plants as Grislea tomentosa, Vitex negundo and trifolia, Biophytum sensitivum, Boerhaavia repanda; species of Jasminum, Clerodendrum, Justicia, Basella, Rottboellia, Anthistiria, Andropogon, and Cenchrus, with many of those beforementioned, as occurring in the most northern provinces. With these there is a mixture of European genera, such as exist also in the southern province of Canton, where species of Galium, Scabiosa, Lycium, Chelidonium, Saxifraga, Sedum, and Reseda, are stated as occurring by Loureiro. It may also be mentioned, that many of the same flowers are common to Indian and Chinese gardens, some of which may also be seen in the summer in gardens in Europe; while others which have been introduced from China, are now common in every part of India, as Chinese Aster, Dianthus, Iris, Pardanthus, and Justicia; with Lagerstræmia idica, Dracæna ferrea, Hypericum monogynum, Kerria Japonica, Hiptage obtusifolia, Olea fragrans, Thuya orientalis, &c.

"It is not surprising, therefore, that the cultivation of every part in the warm weather months, is, as we have seen it to be the case even in the most northern province, like that of India; to the list there given we have only to add sugar, and the mulberry for the silk-worm, to have a cultivation identical with that of India during the warm weather and rainy season. Irrigation supplies in China the want of a regular rainy season in the most northern provinces. The analogy is still greater, for at the termination of the rice and millet crop we find wheat, barley, buckwheat, peas, beans, lucern, and tobacco are grown. For we learn from Staunton and Abel, that as the Sorghum vulgare, the Jooar of India, and Kow-

leang, or tall corn of the Chinese, was cutting down in the northern, and sugar-cane in the southern provinces, wheat was seen springing up, and about two inches high, about the middle of October and November. Thunberg states, that it flowers in March; so that the crop must be gathered in, about the same time as in India, that is, about the end of March or beginning of April. Mr. Gutzlaff more specifically mentions the two crops, one of rice, and the other of wheat, in the cold season. That the accession of the cold weather is sudden we may infer from being informed by Mr. Bell, that on their arrival in China, near the great wall, they were supplied with water and musk-melons, and on the 6th of November, only a few days afterwards, they encountered a 'great fall of snow, and a cold frosty wind.' Mr. Gutzlaff also states, that the 9th of November, when in 40 deg. of lat., was a very pleasant day, but during the night the wind changed, and a strong northerly breeze began to blow, the cold was piercing, and in a few hours the rivers and creeks were frozen over. (Voy. to China, p. 147).

"That the perennials and the botany in general of the southern provinces is very distinct from what we have seen to characterise the central and northern provinces, with the exception of a few annual species of European genera, allowed to exist during the coolness of the winter months, we may learn from the writings of Loureiro and Roxburgh, the relations of travellers, and the plants which have been introduced into Europe. From these sources we learn the existence of a species of Nepenthes, near Macao, with numerous Scitamineæ, and tropical Epiphytal Orchideæ, several Palms, as the Cocoa, Areca, and Cane palms, together with species of Caryota, Rhapis, Chamærops and Tacca, in the most southern provinces; with Pandanus odoratissimus, and Cycas inermis. Aloexylon Agallochum, the Eagle wood of the ancients, and Aloes wood of the moderns, Baryxylum rufum, iron wood, with species of Canarium, Phyllanthus Emblica, and Guilandina Bonduc, are specimens of some of the trees. Laurus Cinnamomum, Camphora and Culilaban, affording camphor and cinnamon. Augia sinensis, Elæococus verrucosus, and Stillingia sebifera, yielding varnish, wood-oil, and vegetable tallow, are some of those affording useful products; while the fruits consist of pine-apples, papayas, guavas, custard-apples, and such as are mentioned at p. 118.

"The principal families to which the rest of the known plants of the southern provinces of China may be referred are, Dilleniaceæ, Anonaceæ, Malvaceæ, Aurantiaceæ, Sapindaceæ; tropical Leguminosæ, as Anagyris, Poinciana, Erythrina; Melastomaceæ, many tropical Rubiaceæ and Synantheræ, Scrophularineæ, Verbenaceæ and Acanthaceæ, Laurinæ, Euphorbiaceæ, Urticeæ, Commelineæ, and tropical Gramineæ. Species of the genera Cocculus, Capparis, Helicteres, Hiptage, Agllaia, Cissus, Combretum, Quisqualis Marlea, Lawsonia, Nyrtus, Eugenia, Passiflora, Callicarpa, Cordia, Convolvulus, Argyreia (Lettsomia. Roxb.) Bignonia, Jasminum, Hoya, Ardisia, Sideroxylon, Tropis, Antidesma, Boehmeria, Basella, Begonia, Musa, Crinum, Philydrum, Aloe, Amaryllis, Asphodelus, Melanthium and Eriocaulon.

"If we compare this with the Flora of Southern India, we shall find that the same great features are common to both; and though the northern provinces of China are more European in their Flora than we any where meet with in the plains of India, yet do their lakes abound with the same plants, and their plains are covered with similar crops. But the Flora of the mountain, including that of the most northern parts of China, has an almost universal identity of genera with that found covering the elevated belt of the Himalaya. If we commence with the bases of these mountains, and pass successively through the several belts, and analogous to what takes place between the parallels of latitude of 40 and 45 deg., experience the rapid decrease of mean temperatures, and the quick succession of vegetable productions, we shall first find a vegetation similar to that of the southern provinces; with the agriculture of the banks of the canal, consisting of rice, millet, amaranth, and an esculent arum, with ginger, turmeric, a little cotton and sugar, at one season, succeeded by wheat, barley, and buckwheat, in the cold weather months, (v. p. 18), even the mountain rice, lauded by Loureiro, meets here with a congenial climate. Along with plaintains, oleander, and some of the orange tribe, and the various plants enumerated at p. 13, we meet with some which were long considered peculiar to China; as Marlea begonifolia, and Houttuynia cordata, with species of Chloranthus, Incarvillea, and Hiptage. At the foot of the mountains of Silhet we meet even with the Chinese fruit Longan and other species of Euphoria. In ascending we pass through different gradations of vegetation, until reaching the regions of the oaks, and rhododendrons, which is immediately succeeded by that of the pines, we meet in the mid region with a Flora which must approximate to that of the mountains of the central provinces of China; for here we find the Chinese genera Abelia and Eurya, together with Stauntonia, Cadsura, Hovenia, Ophiopogon, and Pardanthus, as well as Deutzia, first found in Japan, to which new species have been added by Bengé from the north of China, and by Dr. Wallich from the Himalayas. In Nepal the latter has also discovered Hovenia dulcis, Taxus nucifera, and species of the equally Chinese genera Camellia, Cleyera, Podocarpus, Raphiolepis, Photinia, and Eriobotrya. But it is in the midst of similar vegetation that the tea-plant is everywhere found; and as we have some of the very genera and species, which were first found in the tea-regions, they point out, that here it may most fitly be introduced. It cannot be a difficult task to transfer from one country to another a plant, which grows naturally and is cultivated extensively, in one which possesses so many of the plants which are common to the two, and not found elsewhere. Particularly when we consider that a tea-plant introduced from China by one of the triennial embassies, has lived for many years in the open air in Nepal, and was there seen ten feet high by Dr. Wallich."

The Aurantiaceæ is also a family presenting great popular interest, and possessing no small commercial importance.

We observe that the author still clings to what is called the *natural system*, and defends it on several grounds, in the fourth part now before us. In the first notice which our Journal took of his work, to be seen in the number for May last, the merits of such a system were discussed at some length; but as he pertinaciously attaches himself to it still, we have no desire to renew the dispute, unseemly in science as controversy must ever be, and we conclude our present notice, highly gratified with the information contributed by Mr. Royle regarding the botany of the East Indies.

CULTIVATION OF ASPARAGUS IN FRANCE.

The part of the garden chosen for Asparagus, is that which is longest exposed to the rays of the sun, and least shaded. A pit is there dug five feet deep or so, and the mould taken from it is sifted, throwing out all stones even of the size of a filbert nut. The best parts of this mould is then laid aside for making up the beds. The materials of a bed are thus placed:—

6 inches of common dung-hill manure.
8 inches of turf.
6 inches of dung as before.
6 inches of sifted earth.
8 inches of turf.
6 inches of very rotten dung.
8 inches of the best earth.

The last layer of earth is then well mixed with the last of dung.

The part is now divided into beds five feet wide, by paths constructed of turf, two feet in breadth and one foot in thickness. The Asparagus is planted about the end of March, eighteen inches asunder. In planting, the bud or top of the

shoot is placed at the depth of an inch and a half in the ground, while the roots are spread out as wide as possible in the form of an umbrella. A small cut of stick is placed as a mark at each plant, as it is laid in the ground. As soon as the earth is settled and dry, a spadeful of fine sand is thrown on each plant, in the form of a mole hill. If the asparagus plants have begun to shoot before their transplantation, the young shoots are cut off, and the planting will, with these precautions, be equally successful, though it should be performed even as late as July. Should any of the plants originally inserted die, they may be also replaced at this season. They ought to be two years old when they are transplanted: they will even take at three, but at four they are apt to fail.

If it be necessary to buy asparagus plants for these beds, it is necessary to procure twice as many as are required. The best of course will be selected from these for planting, and the remainder should be placed in some remote situation of the prepared bed; but without separating the plants. Here they must first be covered with four inches of sand during summer, and as soon as the frost sets in, with six inches of dung after that.

The stems of the planted asparagus are cut down as soon as the frost commences, and close to the ground. The beds are then covered with six inches of dung, and four of sand. In March again the beds must be stirred with a fork, taking care not to approach so near to the plants as to derange them. Towards the end of April the plants which have died, may be replaced with the reserved ones above described.

In three years the largest plants will be fit for use. If the beds be sufficiently large to furnish a supply in this manner, the asparagus shoots should be cut as fast as they appear, otherwise they must be left till the quantity required has pushed forth, in which case, the variety in colour and size is not so taking in appearance. A knife is used in cutting them, by slipping it along the stem, till it reaches the bottom of the shoot where the cut is conveniently made, the knife being much in the form of a long bladed chisel. At the end of four years the great and small ones may be taken indiscriminately. The cutting should cease about the end of June.

At the beginning of winter, the stems are all cut away and the beds covered with dung and sand in the manner above described. If muddy sand from the sea shore can be procured for the several purposes already named, so much the better; but if it cannot, river sand may be used, and if that is not to be obtained, fine earth may be substituted. Such an asparagus bed as has been described will generally last thirty years: but if planted in such abundance as to require cutting only once in two years, half the bed being always in a state of reservation, it will last for a century. The turf used in making the beds should be very free from stones.

Care must be taken not to tread on the beds, and to prevent any such accident a plank should be used to step upon. The divisions which are formed of the beds by thick turf is intended to prevent the condensation of the earth below, in consequence of the necessary walking that is there. The turf ought to be renewed every three years, that the ground below may be stirred; and in applying the winter coat of manure, even these walks must be covered, otherwise the plants which grow near the walks will be much inferior to those in the middle of the beds.

ON DAHLIAS.

The following observations on these plants are abridged from a long account by Joseph Sabine, Esq., to be found in the Transactions of the Horticultural Society of London. Dahlias, when introduced into this country, excited great and singular interest. Independently of the superior beauty and diversity of the flowers, they have added a particular ornament to our gardens at a season of the year when formerly they were very naked and tame. The merit, however, of first carefully attending to their cultivation belongs exclusively to the continental gardeners; so that persons visiting the continent from this country on the return of peace in 1814 were surprised with the splendour and the varieties of this genus.

Dahlias were named in honour of Dahl, a Swedish botanist, but they are natives of Mexico, where Baron Humboldt found them growing in sandy meadows many hundred feet above the level of the sea. Much confusion has been occasioned in the names of the various species by different botanists having divided the plants differently. But the names *superflua* and *frustranea*, by which the species are now distinguished, are terms that designate that part of the character of the plants which depends on the fertility or barrenness of the rays of the flowers. There can be little difficulty in distinguishing the two species by considering duly *all* the characters of each. The *superflua* or *purple* kind is more coarse and diffuse in its growth and habit; and the other more delicate and compact as well as more upright; the stems of the *frustranea* or *scarlet* are perfectly round, and though in most cases quite as tall as those of the other, are generally slighter, and are always much covered with a glaucous dew, resembling the bloom on a plum, and are never hairy or downy. The leaves of the *frustranea* are smaller, of a brighter green, and of a slighter texture than is observable in the *superflua*; and the portions of the leaves of this last are generally broader than those of the other species. The flowers also of the *frustranea* in plants of equal vigour and health are uniformly less than those of the *superflua*, and the florets of its disc, are more elevated above the level of the ray. Mons. de Candolle has also noted a difference in the roots of the two species, which will be very serviceable to distinguish them in winter. The tubers of the *superflua* are always closely united to the main stem, whilst those of the *frustranea* are more or less appended to it by short strings and fibres.

The progress of the increase of the varieties at present existing is curious. In the royal garden at Madrid they were a long time without any indications of change: and some years elapsed after they were spread through Europe before any extensive increase or variation took place. But in 1808 Count Lelieur began to direct his attention to the dahlias. Amongst the plants raised at St. Cloud he mentions three with double flowers—the purple, rose, and buff, as well as several striped and shaded single ones. It was to his liberality that the Horticultural Society was first indebted for their fine assemblage of dahlias. Other enlightened cultivators succeeded on the continent in producing improved kinds by cross impregnations of the stigmata of the florets. In our own country there was an early promise of great success, had a right plan of management in keeping the plants been hit upon.

The plants of the *superflua* species, Mr. Sabine observes, which are raised from seeds, vary extremely in the form of the leaves, and the appearances of the stems; but as these differences do not at all affect their beauty, it is unnecessary to notice them farther than that such variations led the early writers on the genus to separate this species into two. The varieties of the *superflua* with single and semi-double flowers are most numerous, for the collections in the principal nurseries round London consist of nearly 150 perhaps, with names, exclusive of unnamed ones, all of them being so different, yet possessed of such qualities as to be much sought after. The colour of the florets of the ray of the flower pass from the darkest purples through lighter shades, into various deep and lighter reds approaching to scarlet; and through pale purples and lilacs into what may be called buffs, becoming paler, until they arrive at different shades of yellow. It seems, with the exception of the white varieties, as if purple and pale yellow were at the extremities of the scale, though there may be exceptions even here. Mons. De Candolle, in his essay on the genus, says, probably we shall never see a blue one, since the variation is from purple to yellow. Blue and yellow he considers are the fundamental types of the colours of flowers, and that they mu-

tually exclude each other. But so numerous are the varieties of the *superflua*, that all speculation is vain on what new changes may be effected by cultivation.

The *frustranea* or scarlet species have not exhibited so many distinct varieties; but it may be remarked that this and the former species have been continually approaching to each other, and as some pains have been taken to disperse the pollen of the various flowers, it has been supposed that hybrid plants have been produced, though Mr. Sabine thinks they exhibit not more diversity of character than may be fairly supposed to have arisen from pure seeds of the *superflua*, which has run into such extraordinary varieties. He says there are unquestionably variations sufficient to destroy the accuracy of the specific characters of the two species; the branches of some of the varieties of the *superflua* are smooth, and covered with a glaucous bloom, and in some instances the florets of the ray are entirely destitute of stigmata.

The varieties are to be obtained from seeds, which should be gathered from those plants whose colour and character are most likely to please, always taking from the dwarf ones, where no preference exists on other accounts. Many of the seedlings will follow their parents, and therefore all will not be new varieties. The seeds are to be sown in March, or earlier, on heat; the young plants, if necessary, to be pricked out into pots or boxes, and kept under cover in warmth until the end of April, when they may be planted out where they are to remain, covering each plant for a time with an empty pot at night, to avoid the effects of spring frosts. The seedlings should be planted in rows, say three feet apart and two feet distant from each other, to allow room for an examination of the different varieties. They thrive best in rich loam, and should have a clear open space to grow in. They seem to suffer if planted often in the same place. The addition of some fresh soil may overcome this evil, if there be not space for the gardener to move their quarters. Wind damages them; therefore they should be carefully tied to stakes as they grow. The seedling plants thus managed will blow in July, and continue in perfection till autumn.

Until a seedling plant shows its flowers, there are no means of ascertaining its value. The proper time to judge of the flowers is in the morning, for the sun injures them. Those produced in summer are much more brilliant than such as appear later in the season; though from the quantity of flowers in September or October the show may be greater. In the selection of the varieties, fancy must be the guide as to colours; the disposition to blow freely, and the having short pedicles, on which the flower stands boldly and well expanded, must also be attended to. These qualities may be looked for particularly from compact plants. Where any particular variety is approved, an increase may be made by cuttings of the young shoots of the branches, as soon as the value of the variety has been discovered. These will readily strike in a moderate heat, under a hand-glass, and in a favourable season they will grow in plain earth under a glass; if well managed they will in either case form roots and tubers before autumn.

Soon after the leaves and young branches of the plants have been destroyed by the frost, they should be cut down: those left in the ground must be protected by heaps of dead leaves or tan. But it is advisable to raise them with their roots and tubers entire, retaining a small part of the stem. The chief point to be attended to in their preservation during winter, is to have them kept plump, yet not so as to be rotted by damp, or touched by frost. Any situation, therefore, where this can be effected will answer as well as potting each root; such as a cool floor in a fruit-room, covering them with sand or coal ashes. When thus covered, however, their crowns should be placed erect and exposed to the air. In spring the roots, if large, may be divided; each tuber having a bud will form a plant.

The roots thus preserved are to be put out when all danger of frost is over; but previously they must be potted in the green-house, the object being to bring them as forward as possible. When put out, they look best in a large mass, and some nicety is required to distribute them in the manner that will be most striking in the particular situation when in flower. The earliest flowers of such treated plants will appear in June. In the spring, another opportunity occurs of increasing, by cuttings, the known varieties which are there to be planted. It is proper to leave only a single stem to each plant, and these will blow in the same season, but a little later than their parents.

In general an abundant supply of water to the roots is not advisable, as it drives the plants into leaf and height, thus diminishing the flowering. Great heat is also unfavourable; and until the weather becomes somwhat more temperate than midsummers are frequently found to be in this country, the flower-buds do not open well, but go off. There has been a speculation on the utility of roots as food. Mr. Sabine has tasted them, and found the old tubers very hard, and the young ones more tender when boiled; but he does not believe that the addition of a good sauce will even make them palatable to be used, except as an object of curiosity. Their flavour was that of a weak aromatic character, resembling ginger, which was stronger in the coat than in the substance of the root, and without which they seemed to be perfectly insipid.

ANGLESEY.

The short papers which we have begun to give of the rural economy of the various counties in the united empire cannot all be possessed of equal value. The leading characteristics of each, are not of the same nature, nor, as respects agriculture and gardening, or in any one of these departments, is every county capable of furnishing lessons worthy of general observance. Anglesey for instance, if we leave out of view its *mines*, which cannot well be considered in this periodical, is greatly behind, in every rural respect, to many other portions of Britain. Indeed the climate and the unsheltered state of the land interpose difficulties not to be surmounted, as compared with many districts; whilst the state of the inhabitants, their established customs and modes of thinking, with various other circumstances, throw such obstacles in the way of rural improvement, as to make it appear probable that Anglesea will long remain in the back ground.

If however we can find little that will directly instruct us, as regards our Journal, in this ancient seat of Druidical fame, it seems not beyond the scope of our province, or of these short county notices, that we endeavour to call public attention to certain deficiencies in rural policy and management; thus indirectly doing our best to be useful. Accordingly we proceed to name some of the obstacles to improvement, and to point out a few glaring errors in the general condition as well as some of the capabilities that distinguish this county.

As to these obstacles we follow the information which has been afforded by writers on the rural state of North Wales. Bleakness of exposure, owing to the want of fences and plantations, and the coal tax, are evils greatly to be deplored as respects Anglesey. Now it is to be observed, that the island was once called the *dark* or the *shady*, in allusion to its thick groves of wood. Yet it certainly is true, that trees will not thrive except they be planted, and here on a large scale. They must also be protected from the depredations of sheep and cattle. Quickset fences, which are so rare, would flourish under the protection of such plantations, and thus mutual aid would be propagated, that would extend to the fields of corn and pasture. For were it not the bleakness of the exposure, the soil of Anglesey is fertile.

The non-residence of proprietors, the want of mutual confidence between them and tenants, the overvalning of land by strangers, who do it at something like a percentage upon the advance, have all been complained of as general evils in the island. It is no wonder that the want of capital should cha-

racterise the farmers under such circumstances, and that leases are in disrepute. It is in perfect accordance with the state of things that the cultivators of the soil should still adhere to many superstitious customs. We do not say that many farmers are not to be found in Anglesey, particularly of late years, who follow pretty close in the march of agricultural improvement; but the majority are and must be still, from the general influences and evils mentioned, little alive to advancement, or capable of finding their way in its course, though perceiving its necessity.

Is it matter of surprise, from what we have said, that a great part of Anglesey is disgraced by cottages that are truly the habitations of wretchedness? Now the farmers, although their intelligence and condition indicate clearly a county's advancement, only do so in conjunction with the cottagers; and although these may be of an inferior grade, when compare dwith the former, yet they ever bear a close and intelligible relation to their superiors: so that a better index cannot be found of rural prosperity and eminence, than is presented by this inferior but most useful class. Too many of these poor people have not a garden, nor so much as a *leek*, except it be bought or begged; so that they cannot illustrate the moral of the adage, "Famine never enters the house through the garden door."

The natural capabilities of Anglesey are not small. Its soil is moderately fertile: were it sheltered and inclosed properly, it would produce fine crops, even of wheat. As it is it grows more oats and barley than the consumption requires: and a number of horned cattle, sheep, and hogs, are annually sent over the Menai. The most valuable product of the island however, arises from the mines. The Parigs mine, for example, is the most abundant in copper ore of any in the known world. And the magnificent suspension bridge recently completed, thrown across the straits of Menai, together with a great road affording a facility of intercourse between London and Dublin, running in connection with this unrivalled bridge, must eventually lead to important changes in the wealth and economy of the county, so that again it may hold true, "that Anglesey is the mother of Wales, because, when other counties fail, she plentifully feedeth them with provision."

The extent of the county is about 271 square miles, or 174,000 acres. The number of inhabitants in 1821 were 46,000. From what has been said, it is clear that the general aspect of Anglesey must be naked and uninviting. There are no considerable hills and valleys to diversify the scenery. The climate is unhealthy in autumn by prevailing fogs, which subject the inhabitants to agues.

GARDEN OPERATIONS FOR DECEMBER.

This month is sometimes so mild, that one is apt to call the weather unnatural and ominous; sometimes floods deluge the earth for weeks together; or again, it is not unfrequently bound by intense frost, and covered with deep snows. It is therefore clear, that no universal directions can within our limits be peremptorily given. The following, however, are applicable to the circumstances which are at the same time supposed.

THE FLOWER GARDEN.

If the weather be not very frosty, let the gardener turn all his heaps of compost, digging every parcel, carefully breaking all clods, and throwing it up with a new surface. Then if the weather be dry, he may give every heap a sprinkling of water. In his gravel walks few weeds rise to trouble him; but it is fit to roll the walks firmly. The beds of ranunculuses, anemonies, and other choice flowers, require care. If snow should fall it will do them no harm; but frost and rain are equally destructive; they must therefore be defended by coverings, on either occasion. The consequence of severe frost, if they be left exposed to it, is evident, and that of rains, if violent, is perhaps, worse; for they not only by their immediate coldness and damp rot the roots, but if this evil should be escaped, the wetness of the ground will give the next frosts double power.

The careful gardener, who sees his present leisure and recollects the hurry of his business in the succeeding spring, will mark out all places where he can plant flowering shrubs, dig them up two spades deep, laying the earth in a ridge, and once in every week or so during winter, stirring and turning it afresh.

THE GREENHOUSE.

The severity of the season will not generally allow the greenhouse plants to have much air now; but let there be no opportunity lost of giving them that advantage, when it can be done safely. Every evening the shutters on the outside of the window and doors should be closed in the worst weather, but when it is anything milder, the plants must be refreshed with air whenever the sun shines well upon the place. The difference between noon-day and night is very great in point of cold, even in the severest seasons; and the air of the hardest time of the day is very different when the sun shines, and when his influence is obscured. If the gardener should keep his greenhouse shut up for a considerable time together, in the same manner as it is necessary to do in the severest nights, he would see the destruction of the whole collection come on gradually; but even the first notice he received this way, would be so late, that a great deal of mischief would be past remedy. The leaves toward the extremities of the branches in several kinds would drop off; and by that time many more would have lost their hold, doomed to follow. The next stage of decay would be seen in these branches themselves. In time the contagion of these decayed leaves would extend itself through the whole place; so that even those plants whose principle of vegetation had been so strong as to resist the mischief at first, would perish at last. At the same time, if the extent of the building were perverted, by leaving the glasses too much open, a great part of the plants would be lost through the absolute cold; close attention therefore is necessary to guard against the two extremes.

A difference between a pure and foggy air is also very great. A thick fog is in winter almost as much to be feared as frost. Such an air, if let in for a few minutes, and then shut up in the greenhouse, may do more mischief in one night than any other accident. The plants now require less water of course than at other seasons, and nothing will more contribute to the damage they may receive from being kept too close, than the addition of that damp which the warmth of the air will raise from the wetted earth. Nothing will promote the decay of the extreme parts of branches, so much as heat, closeness, and moisture.

The stove is a thing that must be particularly guided: and the gardener must judge from the aspect of his plants how the air is to be heated. If they shoot too freely, let the fire be slackened; if they appear faint, let it be increased. It must also be closely watched, whether they require more or less water, and let none be used that has not stood a day and night in the stove, and give this but sparingly to those that most require it—such as the shrubs and plants of a firm structure; and scarcely any to the Cereus kinds. These have no leaves to lose, therefore there is less danger of their wanting moisture: but with regard to the others, as the heat of the air keeps them perspiring, they must be supplied proportionally at the root, otherwise they will be stripped one by one of their leaves. The woody kinds will require water most frequently, the herbaceous in a middling degree, and the succulent least. Those that require most should have it allowed them, not by an increase of the quantity, but by repeating it the oftener; and it will be for the advantage of the plants in general not to water too many at a time.

NURSERY.

The earth above directed to be thrown up in ridges, that is intended for planting in February, should be broke and turned in a mild day, that the frost and winds may be received on a fresh surface. There is no season when a gap or breach in the fences of a nursery can be so injurious as at present, both as respects the cutting winds and vermin. Let all be kept secure,

and the young trees well supported by stakes, whilst their roots are preserved by covering the earth immediately around them. If the rains lodge in any part, cut drains to let them off. In winter a wet ground gives the frost too much power upon the roots, and in spring it makes the shrubs shoot too fast. The business in a nursery is to make the plants grow firm and sound, which will never be insured when the ground is not duly drained. The beds of seedlings, whether of the flower or tree kind, must be sheltered a little by some sort of covering, according to their nature, if the frost be severe.

FRUIT GARDEN.

If the weather be open, there is no time when the spade can be used to more advantage, as respects fruit trees. The season is approaching for roots drawing nourishment, and those of trees do it sooner than many imagine; therefore let the earth, if possible, be now prepared to give way to their young fibres, and to supply them with proper juices. It is proper to dig up all the ground between the trees in an orchard a full spade deep, picking out the roots of weeds, breaking the clods, and afterwards a little soot may be sifted over the earth, and next a little pigeon dung. United to such operations, a free but judicious use of a bill and a saw among the branches will tend greatly to insure a good crop.

KITCHEN GARDEN.

Look to the artichoke beds, lately covered with mould; if the frost threaten, let a little dry pease-haulm be scattered over them, and if wet lodges let it be carried off. In a mild day dig up some spot for a crop of peas and beans. Probably the best bean for this plantation is the Sandwich, and the hotspur pea is also a very proper sort for this early sowing. The mushroom beds require good care now, and will repay it. Heat and moisture principally promote the growth of the spawn; but if either of these be in too great a degree, they will fail in their operations. Much wet will drown the whole, but a good covering of long straw will keep the seed from frost and rain; this must be dry when laid on, and removed when it grows damp and falls, to be anew supplied. The cauliflower plants under glasses are in all respects in the condition of green-house plants, so that the glasses must be let down in the evening to cover them close from the night frosts, but towards noon in a severe day they should always be opened. If any dead leaf appear upon them it must be taken off; the mould must be drawn up about their stems; and it will be of service to stir the surface a little within the glass frequently, and to dig it up round about it. Give air to the young salleting, for it will no more thrive on a hotbed kept close, than it will shoot now in the exposed ground. If the weather be tolerably mild, the several cabbage kinds may be planted for seed, selecting such as have the firmest and shortest stems.

Such are some of the garden operations which may properly fall within the month of December, though of course there are many other points and plants than we have enumerated that may call for attention. But a prudent application of the above rules may be very widely applied.

METHOD OF DESTROYING ONE SORT OF THE GOOSEBERRY CATERPILLAR.

A GARDENER requires to know how to subdue the devouring hordes of insects which infest the sphere of his occupations. There is not a seed thrown, nor a plant put into the ground, but is liable to be destroyed by some kind of insect, reptile, or vermin. Many insects not only feed upon plants, but constantly lodge about them in one shape or another, producing distempers and failures in the vegetable kingdom, often imputed to other causes. Gooseberry caterpillars have long been a theme of complaint; numberless are the methods that have been adopted to overcome them; among which, we think, the following is one of the most sensible: and as it claims to be put into practice in winter, we insert an account of it at this season.

Of caterpillars there is one kind which goes into winter quarters precisely under the bushes whereon they were fed; and if any old dung or rotten leaves lay under the branches or about the roots, they resort thither. This fact, we are told, may be proved by watching particularly the progress of such creatures on some selected bushes. The inclemency of winter does not destroy them in the situation to which they naturally resort. In the course, therefore, of the winter months, pare all the earth from under the bushes, to the depth of about three inches, turning it into a flat ridge betwixt the rows. On the first dry day afterwards, tread, beat, or roll the ridges, and trench the whole down one and a half or two spades deep, observing to tread the foul earth into the bottom of the trench.

From what has been asserted of the winter habitations of these insects, gooseberry bushes should not be planted beside box-edged walks, flower-borders, or rows of strawberries. The season of the caterpillar's destructive reign is from the end of March to the month of June, when cold easterly winds prevail, which seems to cause the fly to take shelter under the young foliage. Hence arose the ancient notion that they were brought by the east wind.

MODE OF PROTECTING FRUIT TREES FROM HARES AND RABBITS.

TAKE hog's-lard and as much whale-oil as will work it up to a thin paste or paint. With this gently rub the stems of the trees upwards, at the fall of the leaf. This has been found effectually to prevent these animals from touching such trees for a longer term even than the ensuing winter. The nature of the ingredients are perfectly innocent, in so far as the trees are concerned: and the ease with which they may be procured speaks for itself.

ALDERNEY CATTLE.

THE island of Alderney is famous for its excellent breed of Cows. But they are in England only to be met with about the seats of the nobility and gentry, on account of their giving exceedingly rich milk, though small in quantity. The race, however, is so delicate and tender ever to be much attended to by our British farmers, for they are not able to bear the cold of England, particularly of its northern parts. They are very fine boned in general, but at the same time are ill shaped. Their horns are crumpled, and their size diminutive. Their colour is light red or yellow, and their beef generally yellow or very high-coloured, fine in grain and well-flavoured. They make themselves very fat, and Mr. Culley says, he never remembers seeing one of them in the least subject to lyer or black fleshed. He adds, that he has seen some very useful cattle bred from a cross between an Alderney cow and a short-horned bull.

We may advantageously follow up this short description of Alderney cows, with a remark on the breeding of cattle, which is confirmed, we believe, by the experience of every one acquainted with the subject. It is a great mistake to endeavour to unite great milkers with quick feeders. The consequence of such an attempt is to get neither sort, as an offspring, in any perfection. If the dairy-man wants milk, let him seek after the milking tribe, both bull and cows, of the best family. The quickest feeders, and those that have the finest flesh, must alone be procured by those who seek after the other class. It has been owing greatly to carelessness in the union of distinct kinds, that so much difficulty frequently occurs in distinguishing the most valuable of either class. The general rule is, that a cow which runs too much to flesh is not a good milker, for the great milkers are uniformly thin. There may be a middling kind of cows that give a tolerable quantity of milk, and also keep in pretty good order, but still such never possess the highest character for either quality.

DAPHNE CNEORUM.

TRAILING DAPHNE.

Class—Octandria. Order—Digynia.

Nat. Ord.—Thymelææ.

Gen. Char.—Corolla four cleft; drupe one seeded.

Spec. Char.—Flowers fascicled, terminal, sessile; leaves lanceolate, naked, mucronate.

This charming little shrub is a native of Switzerland and Austria; growing in such abundance on many of the mountains near Vienna that women gather it when in flower and sell it in the markets. Its beautiful and fragrant blossoms come forth in April and May, the principal season for its flowering, but it frequently blows during most of the summer, and even in autumn.

It is extremely hardy, and should be planted wholly or in part in vegetable moulds, and should never be unnecessarily removed, or any attempts made to thwart its natural habit of creeping, by supporting the branches off the earth. Thus treated, the daphne-cneorum will luxuriate and spread in every direction, and in spring will exhibit its beauty, emblazoning the earth, and surpassing every shrub of similar habit or magnitude that may rival its claim to admiration.

ALYSSUM SAXATILE.

ROCK MADWORT OR YELLOW ALYSSUM.

Class.—Tetradynamia.——Order.—Siliculosa.

Natural Order.—Cruciferæ.

Gen. Char.—Silicle orbicular or elliptical, with valves flat or convex in centre; Seeds 2-4 in each cell; Calix equal at base; Petals entire; some of the stamens toothed.

Spec. Char.—Stem half shrubby at base, subcorymbose; leaves lanceolate entire downy; Pods obovate, orbicular, 2 seeded: Seeds edged.

As this plant has very generally obtained in gardens and nurseries the name of yellow Alyssum, we have retained it; for though it is not the only one of the genus which produces yellow flowers, it may still be called yellow by way of eminence, such is the extreme brilliancy and profusion of its blossoms.

Although not generally more than a foot in height, its branches spread, and generally much exceed that length, on account of the trailing position that they assume near the root.

It begins to flower about the latter end of April, and continues to blossom through great part of May; and it is not unusual for it again to assume its vernal beauty in Autumn.

If it has a pure air and a dry situation, it will grow in almost any soil. The usual way of propagating it is by slips, or cuttings.

As it is a small shewy, hardy plant, and not disposed to overrun others, it is very suitable to embellish rock work. Is a native of Crete, and was first introduced to this country in 1731.

LITHOSPERMUM PURPUREO CÆRULEUM.

PURPLE AND BLUE GROMWELL.

Class.—Pentandria.——Order.—Monogynia.

Natural Order.—Boragineæ.

Gen. Char.—Calyx 5 parted persistent; Corolla funnel shaped, with a half 5 cleft obtuse limb, and an open orifice; Anthers included; Stigma obtuse, bifid; Seeds 4, hard, smooth, closed at the base.

Spec. Char.—Leaves lanceolate, acute at each end; Stem herbaceous; Corolla much longer than Calyx; seeds smooth.

This is one amongst the prettiest native plants of which England can boast. Its changeable hue, and the brightness of its fine blue tints, when fully expanded, render it particularly attractive. The long woody perennial root produces many round, hairy, leafy stems, most of which are procumbent, and throw out roots: the flowering ones only are perfectly erect, and about 12 or 18 inches high. The leaves are numerous, and clothed with short close pressed bristles. The beautiful flowers appear in April or May, standing erect in a sort of double leafy spike, whose extremities are a little curved downwards before flowering. It rarely produces many seeds, like most plants that increase much by the roots they are frequently abortive. The seeds are singularly hard, glossy and grey, like polished marble.

It grows freely in a light soil, mixed with old mortar, and may be increased by its trailing stems being turned back, and hooked down as layers.

GAZANIA RIGENS.

RIGID GAZANIA.

Class.—Syngenesia.——Order.—Frustranea.

Natural Order.—Compositæ.

Gen. Char.—Receptacle naked or alveolate; Pericarps very villous; Pappus hairy paleaceous; Involucrum 1 leaved, the tube naked or covered with imbricated leaflets.

Spec. Char.—Leaves lanceolate, spatulate, and pinnatifid entire, white with down beneath; Peduncle 1 headed, terminal.

The greenhouse to which this splendid little plant properly belongs, can scarcely boast a more shewy plant; its blossoms, when expanded by the heat of the sun, (and it is only when the sun shines on them that they are fully expanded,) exhibit an unrivalled brilliance of appearance.

It flowers in June, but rarely brings its seeds to perfection in this country, which is of the less consequence, as the plant is readily increased by cuttings, which require to be placed under a hand-glass in a cool border, and when rooted, to put them in a sandy compost, and to be protected by a cold frame during winter. These may be transplanted into the borders of the flower garden in May. Native of the Cape of Good Hope, and introduced here in 1755.

NIEREMBERGIA PHŒNICEA.

PURPLE NIEREMBERGIA.

Pentandria Monogynia.

Nat. Ord.—Solaneæ.

Gen. Char.—Corolla infundibuliform, five-lobed. Style dilated upwards. Stigma orbicular, marked with a transverse line. Capsule two-celled. Dissepiment parallel with the valves. Seeds studded with numerous raised points arranged in lines.

Spec. Char.—Leaves ovate, lanceolate, alternate, rarely opposite; flowers axillar, solitary; Calyx deeply five-partite; corolla broadly infundibuliform; lobes entire.

When trained against a wall, this species so extends itself as soon to cover a space of more than forty square feet, exhibiting at one time above three hundred beautiful and richly-coloured purple flowers; few plants, therefore, afford a more numerous display than the Nierembergia phenicia.

It may be increased by seeds sown early in spring on a hot-bed.

TETRAGONOBULUS SILIQUOSUS.

SQUARE-PODDED WINGED PEA.

Class—Diadelphia. Order—Decandria.

Nat. Ord.—Leguminosæ.

Gen. Char.—Alæ of the corolla covering by their upper edge; filaments dilated upwards; legume square with four wings.

Spec. Char.—Pods solitary; stems procumbent; leaves downy beneath.

In this species the stems spread from the root, on the surface of the soil, they are about a foot in length, clothed with a white pubescence. The extreme ends of the shoots and lateral branches are raised from four to six inches high, producing their large pale yellow flowers through several successive weeks. The pods are coriaceous and four-angled. It is peculiarly well calculated for reclining on stones or spar, where it is shown to the greatest advantage.

It flowers in July and August, and may be increased by seeds, which should be sown early in April, upon an open bed or border exposed to the sun, where the plants are to remain: when they come up they must be thinned, leaving them near

two feet asunder, and afterwards they must be kept clean from weeds, which is all the culture they require.

Native of the south of Europe, and was first introduced to our gardens in 1683.

POLYGONATUM MULTIFLORUM.

MANY-FLOWERED SOLOMON'S SEALS.

Class.—Hexandria.——Order.—Monogynia.

Gen. Char.—Flower 6 cleft, cylindrical; Filaments inserted into the top of the tube; Berry globose, 3-celled with 2-seeded cells; Flowers axillary.

Spec. Char.—Leaves alternate stem clasping; Stem round; Peduncles axillary many flowered.

A native of woods and thickets in various parts of England, though not very common. It is often met with in country gardens, and will even bear the smoke of London. It is perennial, flowering in May or early in June, and is admirably adapted to the filling up a damp and shady corner, where but few others will thrive.

The roots are fleshy, creeping horizontally, and are said by Linnæus to be often made into bread by the hardy inhabitants of Sweden. The stems are annual, a foot or more in height. The leaves are elliptical, each of these towards the middle part of the stem, bearing from their bosoms a branched flower, of a whitish colour tipped with green, very slightly downy at the summit, with a faint smell of bitter almonds. The berries are red; they are rarely produced, the plant increasing so much by the root. The unripe germen has a sweetish taste, like green peas.

In speaking of its virtues, Gerard writes, not very gallantly, that the bruised roots takes away "blacke or blew spots gotten by falls, womens' wilfulness in stumbling vpon their hastie husband's fists or such like."

It may be increased by dividing the roots in spring or autumn, and planting them in a shady situation.

DIANTHUS PLUMARIUS.

FEATHERED PINK.

Class—Decandria Digynia.

Nat. Ord.—Caryophylleæ.

Spec. Char.—Glaucous; stem 2-3 flowered; teeth blunt; bracte ovate; very short pointed; leaves linear, rough at edge.

This species is perennial, with the stem ascending, a foot or eighteen inches in height, and branched. The leaves are of a glaucous hue, very sharp at the end. Flowers 1-2, seldom 3, at the end of the branches; they possess a sweet scent. Calyx glaucous, green, longer than in the other species; petals large, light red or bright purple, sometimes white, with a circle of red; deeply jagged, having a red down at the base of the lamina or border. Anthers red. Capsule shorter in proportion than in the other species.

It flowers from June to August, and is a native of Europe and North America: on rocks, mountain pastures, and dry woody places. Introduced in 1629.

Pinks are sometimes increased by layers, but the facility of propagation by pipings has nearly superseded the practice of laying them.

The best time for this is about the end of June, but will vary with the season. It should always be done immediately before or during bloom; or indeed so soon as the young shoots are of a sufficient length for the purpose; that is, to form pipings from two to three inches in length. Pipings are made by taking a branch of the pink, and immediately below the second or third joint from the top cut it off, and the piping will be readily disengaged from the bottom of the two leaves which form a sheath round it, leaving it clear. The leaves may be shortened, but it is unimportant. They should be planted in a shady situation, and the soil should be a rich light compost, three or four inches deep; if no rain falls it should be well soaked with water a few hours before they are planted. The pipings need not be planted at a greater distance than three inches square and about half an inch deep. The ground should then be closed very hard upon them, and they must be well watered, and a hand-glass placed over them: the waterings must be repeated as often as is found necessary, till they have taken root; after which they will require no other care than to keep them clear from weeds till autumn, when they should be transplanted to the borders of the flower garden, where they are to remain. During the growth of the pipings, remove the hand-glass for the space of ten minutes, daily, to give the pipings air, shading them during the removal, if exposed to the rays of the sun; and at the same time, turning the hand-glass bottom upwards that its interior may be dried. When the pipings begin to grow, air should be admitted under one side of the glass, to inure them gradually to the atmosphere.

GENTIANA VERNA.

SPRING GENTIAN.

Tet—Pentandria Digynia.

Nat. Ord.—Gentianeæ.

G. corolla quinquefida infundibuliformé, foliis ovatis acutiusculis: radicalibus patentibus; caulinis majoribus. Willd. sp. pl. 1. p. 1342.

This very elegant plant is a native of this country, particularly of the forest of Teesdale, Durham, where it is known to the inhabitants by the name of Spring Violet, as it copiously enamels that country at a time when no other flower enlivens the dreary scene.

The root is perennial, thread-shaped and creeping. Stems about an inch high, simple, single flowered, thickly clothed with leaves, which are more especially clustered in the lower part, and are of an ovate form, entire, generally pointed.

The flower is terminal, solitary erect, large, of a most vivid blue colour. The whole herb is smooth, less bitter than most gentians, and from its beautiful appearance, deserving a place in every collection.

ROSA SEMPERFLORENS.

EVER BLOWING ROSE, OR DARK CHINESE ROSE.

Icoysandria Polygynia.

Nat. Ord.—Rosaceæ.

Rosa semperflorens, fructibus oblongis pedunculisque hispidis caule petiolisque aculeato hispidis; foliis subternatis aculeatis. Willd. sp. pl. 2. p. 1078.

We are induced to consider this Rose, as one of the most desirable plants in point of ornament, ever introduced to this country, its flowers large in proportion to the plant, are semi-double, and with great richness of colour, unite a most delightful fragrance; they blossom during the whole of the year; more sparingly indeed in the winter months; the shrub itself is more hardy than most green-house plants, and will grow in so small a compass of earth, that it may be reared almost in a cup; is kept with the least possible trouble, and propagated without difficulty by cuttings or suckers.

STEVIA PURPUREA.

PURPLE STEVIA.

Syngenesia polygamia æqualis.

Nat. Ord.——Composite.

Gen. Char.—Recept. nudum: Pappaus paleaceus. cal cylindraceus, ex simplici foliorum seri. Spec. Char. Foliis. lanceolatis. trinervis, Canaliculatis corymob fastigiato.

A hardy perennial herb, native of Mexico. Flowering from July to September, but of no striking appearance. The stem is two feet high, inclined or spreading, round, leafy, its branches terminating in numerous small corymbose flowers, of a reddish hue. The leaves are rather more than an inch long, shining, dotted, and occasionally serrated towards the top.

ERYTHRONIUM AMERICANUM.

YELLOW FLOWERD DOGS-TOOTHED VIOLET.

Hexandria Monogynia.

Nat. Ord.—Tulipaceæ.

Erythronium Americanum ; foliis lanceolato—ellipticis, mucrone condriplicato; stylo clavato, sulcato-trigono, one stigmatoso triangulosæ subhiante intus glandulose pubescente terminato ; antheris luteis. Erythronium dens Canis ; foliis lanceolato obongis, flore flavescente, Michaux Flor. Bor.—Amer. 1. 198. Nec Linnei.

It is a hardy perennial, native of the colder parts of North America. The bulb is solid, about the size of a filbert, covered with membranous dark brown coats. The leaves are coriaceous, elegantly stained with liver-coloured blotches, and have a hooded termination, from the revolute edges of the point. The flower is deep yellow spotted with red. Anthers and pollen yellow.

CALOPHYLLUM INOPHYLLUM.

SWEET-SCENTED CALOPHYLLUM.

Polyandria Monogynia.

Calophyllum Inophyllum ; foliis ovalibus. Willd. sp. pl. 2, p. 1159, Ponna. Rheed. Mal. 4 p. 79. t. 38. Rai. Hist. 1525. Bintangor maritima, Rumph. amb. 2, t. 71. Arbor indica, medicæ amplioribus foliis, Plunk. alm. 41. Inophyllum Burm. 130.

It grows to a large tree, with the trunk thick, covered with a blackish, cracked, almost scaly bark, and supporting a vast umbrageous head. The leaves are four or five inches long, and nearly three inches broad, shining, smooth on both sides, and remarkable for the numerous extremely fine parallel nerves, which Burman fancied to resemble the fibres of a muscle dissected longitudinally, and thence called it inophyllum.

The flowers are white and fragrant, the fruit very resinous or oily ; kernel at first sweet, afterwards bitter.

When the bark is wounded, there exudes a viscous, yellowish fluid, which thickens and hardens in the air. It is called green balsam, or balsam of the Virgin Mary, and is used as a vulnerary.

ANISOMELES OVATA.

BROAD-LEAVED ANISOMELES.

Didynamia gymnospermia.

Nat. Ord.—Labiatæ.

A. foliis ovatis subcordatis crenatis, verticillis multifloris, bracteis linearibus, calycibus pilosis ; glandulis inconspicuis. Ait. Hort. Kew, Ed. 2, v. 3, p. 364. Marrubium odoratissimum betonicæ folio. Burm. Zeghs. 153 t. 71. f. 1.

The whole herb has a velvet-like softness, owing to its fine, short, soft, depressed hairs. The leaves sometimes vary much in size, shape, and serretures, but are oftener crenate than serrated ; whorls for the most part crowded into thick, portly, leafy spikes. The calyx is very curiously reticulated with copious transverse veins ; its teeth large, broad, and pungent. The upper lip of the corolla short. The seeds are beautifully polished, elliptical, and of a shining black.

This plant is a native of the East Indies, and is hardly ever preserved in the stoves, being an annual of no great beauty, however interesting to the curious botanist.

PLATE 55.

PITCAIRNIA BROMELIÆFOLIA.

PINE-APPLE-LEAVED PITCAIRNIA.

Hexaudria Monogynia.

Nat. Ord.—Bromeliaceæ.

Pitcairnia bromeliæfolia. P. floribus laxe racemosis, pedicelis calycem æquantibus, foliis inferne ciliato—spinosis. Pitcairnia bromeliæfolia. L'Herit. sert. angle. p. 7, t. 11. Swartz. Fl. Ind. Occid. 1. p. 580. hane, illustr. t. 224. Pitcairnia bromiliæfolia. P. foliis ciliato spiniosis, pedunculis germinitusque glaberrimiso Ait. kew. 1, p. 401. Schnev. ie. fasc. 4. t. 11. Wild. Spec. 2, p. 10. Poir. Dict. Enc. 5, p. 534. Hepetis Angustifolia, Swartz. prod. 56.

An inhabitant of Jamaica, where it is said to grow on the shady sides of mountains, flowering in April and May.

The rachis of the raceme as well as the peduncles and corrolla are of a fine scarlet colour ; the latter is persistant changing to a greenish, and lastly to a brownish hue. The transparent scale at the inner base of each segment is of an ovate form, truncate at the top, crenate, attached by its back, while the edge and summit are free. Radical leaves from three to four feet long, scarcely an inch broad when flattened. Scape terminal, a foot high, many flowered.

Is is a very ornamental plant ; requires to be kept in the tan pit ; often seeds ; but is generally propagated by offsets.

END OF VOL. II.

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